

# Smart Ringswitch Family User Guide

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## **Smart Ringswitch Software Release 4.2**

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## Before you start

### About this guide

This guide describes how to use Madge Networks' Smart Ringswitch Plus and Smart Ringswitch Express with Ringswitch Software Release 4.2. Note that Software Release 4.2 does not support the Smart Ringswitch.

### Conventions

Throughout this guide, the term Ringswitch is used to refer to any Madge Ringswitch model.

### Associated guides

This guide tells you how to configure a Ringswitch. For information about installing a Ringswitch and its associated modules, refer to *Getting Started: Smart Ringswitch Family* (part number 100-315).

### Audience

This guide is for network administrators. It assumes you are familiar with:

- token-ring networking
- the principles of LAN bridging and token-ring switching (for more information, see Appendix A, Network design issues)
- IP routing, if you are using the Smart Ringswitch TLS Module

### Safety

To make sure you do not injure yourself or damage your Madge product, read *Madge Networks Safety Guidelines* (part number 102-002) before installing the product.

### The guide

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## Notes, cautions, and warnings



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**Note:** A note icon indicates information that you should observe.

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**Caution:** A caution icon indicates the possibility of damage to data or equipment.

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**Warning:** A warning icon indicates the possibility of a threat to personal safety.

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## Acknowledgments

Madge, the Madge Logo, Ring Access Module, Ringhub, Smart Ringswitch, Smart Ringswitch Plus, Smart Ringswitch Express, HSTR Ready, GroupSwitch, Smart CAU, Smart RAM STP, Smart RAM Plus UTP, Smart LAM STP, Smart LAM Plus UTP, Smart Ringbridge, TrueView, and TrueView/32 are trademarks, and in some jurisdictions may be registered trademarks, of Madge Networks or its affiliated companies. Other trademarks appearing in this document are the property of their respective owners.

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# Introduction to the Smart Ringswitch Family

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The Smart Ringswitch Family is a range of stackable token-ring switches that supports the connection of wiring concentrators or lobe stations, over a range of different network media, at ring speeds of 4, 16, or 100 Mbps. You can also connect Ringswitches to different types of network, such as an Ethernet network, a Fiber Distributed Data Interface (FDDI) network, or an Asynchronous Transfer Mode (ATM) network.

## Features of a Ringswitch

The following sections introduce features of a Ringswitch:

- LAN bridging techniques
- Third Layer Services
- Cut-through switching
- Configurable port interface mode
- Full-duplex token-ring connections (DTR)
- Active Broadcast Control (ABC) and virtual LANs
- Remote Monitoring (RMON) support
- Traffic Profiling
- Protocol Filtering
- Management
- Connection to Ethernet LAN segments

## LAN bridging techniques

The Ringswitch offers four bridging techniques:

- Source-Route Bridging (SRB)
- Transparent Bridging (TB)
- Source-Route Transparent (SRT) bridging
- Source-Route Transparent Plus (SRT+) bridging

These bridging techniques enable you to select the mode that best matches the network environment. The forwarding mode is set as a global parameter for each Ringswitch.



**Note:** To support transparent bridging, SRT bridging, or SRT+ bridging, the Ringswitch must have a Switch-2 or Switch-3 Module installed.

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For information about bridging techniques, see Appendix A, Network design issues.

### Third Layer IP Services

The Smart Ringswitch TLS Module offers IP routing capability, known as Third Layer IP Services. IP routing is useful in environments where a flat Level 2 network architecture is not feasible or desirable. The Smart Ringswitch TLS Module supports three IP routing control protocols:

- static routing configuration
- dynamic RIP v1/v2 routing control
- dynamic OSPF routing control

On a Smart Ringswitch TLS Module, you can define up to sixteen “leg ports” (virtual router interfaces), each representing a connection to an IP subnet. You can then associate groups of physical Ringswitch ports with the leg ports.



**Note:** To support Third Layer IP Services, the Ringswitch must have a Switch-3 Module and a Smart Ringswitch TLS Module installed.

For more information about the Smart Ringswitch TLS Module, see Chapter 10, Configuring the Smart Ringswitch TLS Module. For information about routing techniques, see Appendix A, Network design issues.

### **Cut-through switching**

Token-ring switching provides a simple and efficient alternative to routing as a means of interconnecting multiple ring segments. Unlike traditional store-and-forward devices, which read entire packets into memory before making a decision about where to forward them, the Ringswitch uses cut-through switching. This means the Ringswitch takes action as soon as it receives the first 20 to 30 bytes of the packets. The Ringswitch analyzes information in the packet header and determines the appropriate destination port. The Ringswitch makes an internal connection between the input and output ports and streams the packet onto the destination ring.

Cut-through switching introduces a typical latency of only 30 microseconds in moving data from one ring to another; in contrast, store-and-forward devices such as bridges and routers can introduce delays of up to 4000 microseconds. Cut-through switching enables clients on different ring segments to communicate with almost the same performance as if both were attached to the same ring.

### **Configurable port interface mode**

You can configure the interface mode of each token-ring port on the Ringswitch for either node or concentrator mode, at a ring speed of 4 or 16 Mbps, or 100 Mbps for HSTR ports, to support attachment to the lobe ports of standard workgroup hubs such as the Madge Smart CAU and Smart RAM Plus UTP intelligent stackable hubs. For directly attached servers, you can connect the server adapter card directly to a Ringswitch port without the need for a hub.

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**Full-duplex token-ring connections**

The Ringswitch supports centrally-based network servers without degradation in network performance or user response times. Centralized servers requiring greater network bandwidth can be directly attached to ports on the switch and have access to the full 16 Mbps bandwidth or to 100Mbps bandwidth if attached to a high speed token-ring port. Directly attached servers can also be attached in full-duplex mode, with a 16 Mbps bi-directional transfer link between the server and the switch. Full-duplex mode provides an aggregate throughput of 32 Mbps between the switch and the server. Server operating systems that can handle concurrent read-write operations can take advantage of full-duplex connections.



**Note:** Madge Networks provides a range of network adapters that support the full-duplex DTR mode of operation.

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**Active Broadcast Control (ABC) and virtual LANs**

The Ringswitch incorporates Active Broadcast Control (ABC) technology that enables management of broadcast traffic on the network. The ABC features are simple to configure, and enable you to monitor the benefits of implementing broadcast control techniques before you fully enable the features. For information about ABC, see Appendix B, Configuring Active Broadcast Control. You can also define virtual LANs to create logical workgroups that are independent of the physical layout of the network, and confine broadcast traffic to a restricted number of ring segments. For information about virtual LANs, see Appendix E, About virtual LANs

### **Remote Monitoring (RMON) support**

Ringswitch Software Releases 2.0 and later include RMON agent software. To use the RMON agent, you must obtain a Smart Ringswitch RMON License (part number: 84-27) from Madge Networks.

For more information about RMON, see Appendix D, About Remote Monitoring (RMON).

**Traffic Profiling**

Ringswitch Software Releases 3.2 and later support Traffic Profiling. This enables you to monitor network traffic by profiling: global SR frame counts, global transparent frame counts, per port SR frame counts, per port transparent frame counts, port mirroring, and port to port frame counts.

*Table 1.1 Traffic Profiling on the Ringswitch*

Frame type	Switch-1 Module	Switch-2 Module	Switch-3 Module/ Ringswitch Express
Global source route frame counts			
Specifically routed frames in / out	Yes	Yes	Yes
All routes explorer frames in / out	Yes	Yes	Yes
Single route explorer frames in / out	Yes	Yes	Yes
Global transparent frame counts			
Frames in / out	No	Yes	Yes
Unicast frames in / out	No	No	Yes
Broadcast frames in / out	No	No	Yes
Multicast frames in / out	No	No	Yes
Miscellaneous frames in / out	No	No	Yes

*Table 1.1 Traffic Profiling on the Ringswitch*

Frame type	Switch-1 Module	Switch-2 Module	Switch-3 Module/ Ringswitch Express
Global bad frame counter (total number of discarded frames)	No	No	Yes
Equivalent counters (per port)	No	No	Yes
Port to port counters			
Source route specifically routed frames	No	No	Yes
Transparent unicast frames	No	No	Yes



**Note:** Miscellaneous frames are frames that do not fall into any other categories, for example, frames with a destination address that has not yet been learned.

## Protocol Filtering

The Ringswitch Software Release 3.2 and later support Protocol Filtering. You can only configure this feature using TrueView Ringswitch Manager. For more information about the management features available, see the next section, “Management”.

Currently, you can configure your Ringswitch to reduce the number of redundant broadcast frames by using ABC filtering. With Protocol Filtering, you can further control and restrict the access of essential frames across the network.

For information about Protocol Filtering, see Appendix C, Protocol Filtering.

## Management

The Ringswitch incorporates a range of advanced management functions that provide management and control over the switched token-ring environment. The Ringswitch is managed from the Madge Networks graphical TrueView Ringswitch Manager, or third party management systems using the Simple Network Management Protocol (SNMP) over IP and IPX, TCP/IP stations using Telnet, or a terminal or terminal emulator using the out-of-band serial port.

TrueView Ringswitch Manager enables you to:

- manage the Ringswitch, bridging, and routing
- monitor traffic and view statistical counters
- erase or download boot code and run-time microcode
- configure ABC features
- configure Protocol Filtering
- configure RMON support
- manage virtual LANs to define a logical network structure that is independent of the actual layout
- view the status of LEDs, and change the LCD display on the Ringswitch

TrueView Ringswitch Manager can be fully integrated into a range of third party management systems including IBM NetView/6000 and HP OpenView for UNIX. To obtain management applications for third party management systems, contact your Madge vendor.



**Note:** For information about installing and using TrueView Ringswitch Manager to manage the Ringswitch, refer to the booklet accompanying the Ringswitch Software CD.

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The Ringswitch supports industry-standard Management Information Bases (MIBs) as well as three MIBs that are specifically designed for use with the Ringswitch: Madge Box MIB (MDGBOX.TXT), Madge Smart Ringswitch MIB (MDGRSW.TXT), and Madge Active Broadcast Control MIB (MDGABC.TXT), and one MIB designed for use with the Smart Ringswitch TLS Module: Madge TLS MIB (MDGTLS.TXT).

The Ringswitch supports the following MIBs:

- Madge Box MIB (MDGBOX.TXT)
- Madge Smart Ringswitch MIB (MDGRSW.TXT)
- MIB-II (RFC 1213)
- IEEE 802.5 Token Ring MIB (RFC 1231, RFC 1239)
- Definitions for Managed Objects for Bridges (RFC 1493)
- Definitions for Managed Objects for Source Routing Bridges (RFC 1525)
- FDDI MIB (RFC 1512) (only supported if an FDDI module is installed)
- Madge Active Broadcast Control MIB (MDGABC.TXT)
- ATM MIB (RFC 1695) (only supported if an ATM module is installed)
- SONET/SDH MIB (RFC 1595)
- LAN Emulation Client Management: DRAFT Version 1.0 Specification
- Smart Ringswitch TLS Module has a separate MIB-II and Madge TLS MIB (MDGTLS.TXT)

The Madge enterprise MIBs are Madge Box MIB, Madge Smart Ringswitch MIB, Madge ABC MIB, and Madge TLS MIB. They are all supplied in UNIX format with the Ringswitch software. If you plan to use a SNMP management application to access the MIBs and have specified a password for the Ringswitch, set the SNMP community string to match the password before editing any variables. Ringswitch Software Releases 2.0 and later include RMON agent software. To use the RMON agent, you must obtain a Smart Ringswitch RMON License (part number: 84-27) from Madge Networks.

The RMON agent software supports the following MIBs:

- Remote Network Monitoring MIB (RFC 1757)
- Token-ring Extensions to the Remote Network Monitoring MIB (RFC 1513)

For information about using a SNMP management application to access the MIBs, refer to the manuals supplied with the SNMP management application.

### **Connection to Ethernet LAN segments**

If you install a Smart Ringswitch 2-Port Ethernet Module into a Smart Ringswitch Plus Chassis or a Smart Ringswitch Express you can connect token-ring LAN segments with Ethernet LAN segments.

For more information about the Smart Ringswitch 2-Port Ethernet Module, see Chapter 6, Connecting Ethernet ports. For information about network issues, see Appendix A, Network design issues.

## About Smart Ringswitch Software Release 4.2

This user guide describes how to use a Ringswitch with Ringswitch Software Release 4.2. If you do not download the microcode software provided with Software Release 4.2 to the Ringswitch, some of the features described in this manual will not be supported.

This section describes how to identify the boot code and run-time microcode files corresponding to this software release and explains how to identify the type of Switch Module that is installed in a Ringswitch. For a software revision history, refer to Appendix H, Features of previous software releases.

### Features supported by Software Release 4.2

Ringswitch Software Release 4.2 supports the Smart Ringswitch Plus Chassis and the Smart Ringswitch Express and introduces support for the Smart Ringswitch 2-Port Ethernet Module.



**Note:** To identify files containing boot code and run-time microcode, examine the first four letters in the filename as shown in Table 1.2. The remaining characters in the filename denote the version number of the software. For the most up-to-date information about version numbers, refer to the README.TXT file on the accompanying CD.

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## Upgrading Ringswitch microcode

Multi-Download is a feature that Madge provides in Ringswitch software Release 3.3 and later. Multi-Download simplifies the upgrades of Ringswitch software by combining downloadable files into a single file including Switch boot code, Switch microcode, HSTR microcode, ATM microcode, Ethernet microcode, and TLS microcode.

To upgrade your Ringswitch microcode, download the latest runtime microcode (this enables your Ringswitch for Multi-Download and makes it aware of any new Ringswitch hardware) and then download the Multi-Download file and your Ringswitch is upgraded. To do this, use the following instructions:

- 1 Upgrade your TrueView Ringswitch manager. The latest version is on the accompanying CD. For information about installing and using TrueView Ringswitch Manager, refer to the TrueView online help or the booklet accompanying the Smart Ringswitch Software CD.
- 2 Upgrade your TrueView Ringswitch manager by running the file you have downloaded and following on-screen instructions.
- 3 Power-off the Ringswitch and ensure the Option Module that you want to upgrade is installed in the correct slot of the Ringswitch. For information about installing Option Modules, refer to *Getting Started: Smart Ringswitch Family* (part number: 100-315).
- 4 Power-on the Ringswitch.
- 5 In TrueView, select “Upgrade code”. To do this, right-click on the red download button on the Ringswitch dialog box and select “Upgrade code”. This automatically downloads all the files that your Ringswitch needs for all installed modules. The Ringswitch will automatically re-boot as part of the upgrade process. When download is complete, you see the message “Upgrade Completed” in the Download Status dialog.
- 6 If you have a Smart Ringswitch FDDI Module in the Ringswitch, download the FDDI firmware from the accompanying CD.

*Table 1.2 Ringswitch software modules in Release 4.2*

Microcode module	Switch module/Ringswitch	Filename	Versions
Run-time	Switch-3 Module	SRPW426R.BIN	4.26
Multi-Download file	Switch-3 Module	REL4_2.BIN	4.2
FDDI firmware	Switch-3 Module	SRSF216R.BIN	2.16

## Identifying the type of Switch Module hardware

To identify the Switch Module, refer to Table 1.3.

*Table 1.3 Identifying Switch Modules*

Ringswitch	Metal carrier ID	Module
Smart Ringswitch Chassis	<None>	Switch-1 Module
Smart Ringswitch Chassis	Switch 111	Switch-1 Module
Smart Ringswitch Plus Chassis	Switch 112	Switch-2 Module
Smart Ringswitch Plus Chassis	Switch 113	Switch-3 Module
Smart Ringswitch Plus Chassis	Switch 113b	Switch-3 Module
Smart Ringswitch Express	<None>	Switch-3 Module

The LCD display of the Ringswitch displays the hardware version. Alternatively, use the TrueView Ringswitch Manager to obtain version information for the Ringswitch.

You can also use the command-line interface (see Appendix G, Using the command line interface) and enter the `show bridge status` command, to obtain version information for the Ringswitch.

The `show bridge status` command displays the following information about the Switch Module hardware:

Command:        `>show bridge status`

Example:        CPU Card Hardware Version:                      2.00.00

The hardware version numbers reported by the `show bridge status` command are described in the following table.

*Table 1.4      Hardware version numbers reported by Switch Modules*

Module	Reported CPU hardware version
Switch-1 Module	0.00.00
Switch-2 Module	Between 2.00.00 and 6.00
Switch-3 Module	7.00.00 or greater

# Configuring the Ringswitch

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The Ringswitch is supplied with the factory-default settings described in Table 2.1. To configure the settings to suit the requirements of your network, we recommend that you connect the Ringswitch to the network and use TrueView Ringswitch Manager. The TrueView Ringswitch Manager is an easy-to-use graphical interface that enables you to discover, configure, and maintain the Ringswitch entirely from the management station.

If you cannot connect the Ringswitch to the network immediately, use the command line interface to perform the minimum number of configuration tasks that will enable you to connect the Ringswitch to a device on the network. For information about the command line interface, see Appendix G, Using the command line interface.

## Preparing to use TrueView Ringswitch Device Manager

To prepare the Ringswitch for management with the TrueView Ringswitch Manager, connect a port to a device that will interoperate with that port in the default configuration.

The default port configurations for the Ringswitch are summarized in Table 2.1 on page 18. For an explanation of the default modes, refer to the chapter in this guide which deals with the appropriate module.

If you do not have a device that will interoperate with a Ringswitch port in the default configuration, configure one of the Ringswitch ports by connecting a terminal to the serial port on the front of the Ringswitch and using the command line interface.

For information about installing and using TrueView Ringswitch Manager, refer to the TrueView online help or the booklet accompanying the Smart Ringswitch Software CD.

The factory default settings are shown in Table 2.1.

*Table 2.1     Factory default settings*

Module	Setting	Description
All Switch Modules	Password	PUBLIC
Switch-1 Module	Ringswitch forwarding mode	Source-route bridging enabled
	Port forwarding mode	Source-route bridging disabled
Switch-2 Module and Switch-3 Module	Ringswitch forwarding mode	Source-route transparent bridging enabled
	Port forwarding mode	Source-route bridging disabled and transparent bridging enabled
Token-ring ports for a Ringswitch with Switch-1 or Switch-2 Modules	Interface mode	Concentrator mode (port 1:4) Node mode (all other ports)
	Ring speed	16 Mbps
	Ring number	401 (port 1:1) through 408 (port 2:4) or 40C (port 3:4)

Table 2.1    Factory default settings

Module	Setting	Description
Token-ring ports for a Ringswitch with a Switch 3 Module	Interface mode	Concentrator mode (right-hand port of each card) Node mode (all other ports)
	Ring speed	16 Mbps
	Ring number	401 (port 1:1) through 408 (port 2:4) or 40C (port 3:4) 411 (port 4:1) to 420 (port 4:16) 421 (port 5:1) to 430 (port 5:16) 431 (port 6:1) to 440 (port 6:16)
Smart Ringswitch 4- Port HSTR Copper Module	Interface mode	Node mode (two left-hand ports of each card) Concentrator mode (two right-hand ports of each card)
	Ring speed	100 Mbps
Smart Ringswitch 8- Port HSTR Copper Module	Interface mode	Node mode (four left-hand ports of each card) Concentrator mode (four right-hand ports of each card)
	Ring speed	100 Mbps

*Table 2.1     Factory default settings*

Module	Setting	Description
Smart Ringswitch 8-Port HSTR Fiber Module	Interface mode	Node mode (four left-hand ports of each card) Concentrator mode (four right-hand ports of each card)
	Ring speed	100 Mbps
Smart Ringswitch 2-Port HSTR Fiber Module	Interface mode	Concentrator mode (right-hand port of each card) Node mode (left-hand port of each card)
	Ring speed	100Mbps
GroupSwitch Module	5-port mode	
FDDI Module	Protocol fixups	Enabled
ATM Module	UNI version	Automatic
	Requested ELAN	Determined by LECS
	Order in which the LECS NSAP is determined	ILMI, Well Known Address, Well Known PVC

Table 2.1    Factory default settings

Module	Setting	Description
Smart Ringswitch TLS Module	Global OSPF	No OSPF areas, OSPF disabled
	Global RIP	Empty RIP neighbor list and ignore neighbor list flag set
	Leg OSPF	No OSPF area assigned
	Leg RIP	Do not send RIP, do not receive RIP Announce default routes, host routes, and static routes Learn default routes, host routes Enable split horizon algorithm No RIPv2 authentication Empty RIP advertise and reject lists
	Leg Multicast	Send over broadcast MAC address
Smart Ringswitch 2- Port Ethernet Module	Duplex mode	Automatic
	Ring speed	Automatic



# Connecting token-ring ports

---

There are two Madge copper token-ring port modules:

- Smart Ringswitch 4-Port TR Copper Module
- Smart Ringswitch 8-Port TR Copper Module

This chapter explains how to configure a token-ring port module to connect the Ringswitch to wiring concentrators, lobe stations, and other Ringswitch devices. A token-ring port module is an optional unit that you can use to extend the functionality of the Ringswitch, or replace an existing port module. A token-ring port module has either four or eight token-ring ports, each with an RJ-45 connector for copper UTP cabling and a DB-9 connector for copper STP cabling, that you can connect to a wiring concentrator, lobe station, or another Ringswitch.

You can connect token-ring ports to the following:

- a token-ring port on another Ringswitch
- a Madge SmartCAU
- a Madge Smart RAM STP or Smart RAM Plus UTP
- an active or passive Lobe Attachment Module (LAM), such as the Madge Smart LAM STP or Smart LAM Plus UTP
- a Multistation Access Unit (MAU) with UTP or STP connectors, or a wiring concentrator with one or more connectors that support the direct attachment of token-ring lobe stations
- a workstation or server that has a token-ring adapter card
- a Madge Local Ringhub
- a token-ring port on a Smart DeskStream Token Ring Switch

## Selecting the port interface mode

The port interface mode affects how the port behaves, and determines the devices you can connect to the port. Each token-ring port on the Ringswitch can act in node or concentrator port interface mode. In node mode, a port behaves like a token-ring adapter and generates a phantom drive signal to insert into the device that is connected. In concentrator mode, a port behaves like a MAU or LAM port and detects the phantom drive signal that is generated when the connected device attempts to insert. For information about how to configure the port interface mode, see Appendix G, Using the command line interface.

The default port interface mode of the token-ring ports on a Ringswitch with a Switch-1 Module or a Switch-2 Module installed is node mode. However, the right hand port in the first slot (port1:4) defaults to concentrator mode.

The default port interface mode of the token-ring ports on a Ringswitch with a Switch-3 Module installed is node mode. However, the right hand port of each of the installed modules defaults to concentrator mode.

Factory default settings for all Option Modules are summarized in Chapter 2, Configuring the Ringswitch, in Table 2.1.

## Connecting devices

Token-ring networks are resilient to the temporary disruption of network signals that occur when nodes insert into and de-insert from the network. Therefore, you do not need to switch off the Ringswitch when connecting and disconnecting cables.

Each token-ring port on the Ringswitch has both UTP (RJ-45) and STP (DB-9) connectors. You do not need to configure the token-ring ports to accept UTP or STP media. The Smart Ringswitch 8-Port TR Copper Module only has UTP (RJ45) connectors.



---

**Caution:** Either connect a device to the RJ-45 connector or the DB-9 connector of a token-ring port. Do not connect devices to both connectors on a single token-ring port. Attaching devices to the UTP and STP connectors of a token-ring port at the same time may damage the Ringswitch.

---

Make sure you:

- configure the token-ring port to support the correct ring speed, or the ring may enter a beaconing condition
- configure the token-ring port for the correct interface mode
  - use concentrator mode to connect a token-ring port to another device that generates the phantom drive signal (for example a Ringswitch port in node mode, or a PC network adapter)
  - use node mode to connect a token-ring port to another device that detects the phantom drive signal (for example a Ringswitch port in concentrator mode)

### Node interface mode

In node mode, a port behaves like a token-ring adapter and generates a phantom drive signal to insert into the device that is connected. Use node mode to connect token-ring ports as shown in Figure 3.1. Table 3.1 describes the devices you can connect to a port in node mode.

*Table 3.1 Copper token-ring port in node interface mode*

Attached device	Connector on device
SmartCAU Plus or SmartRAM	Token-ring signal connector
UTP or STP LAM	Node port
Madge SmartLAM or Madge SmartLAM Plus	Node port
UTP or STP MAU or other token ring wiring concentrator	Node port

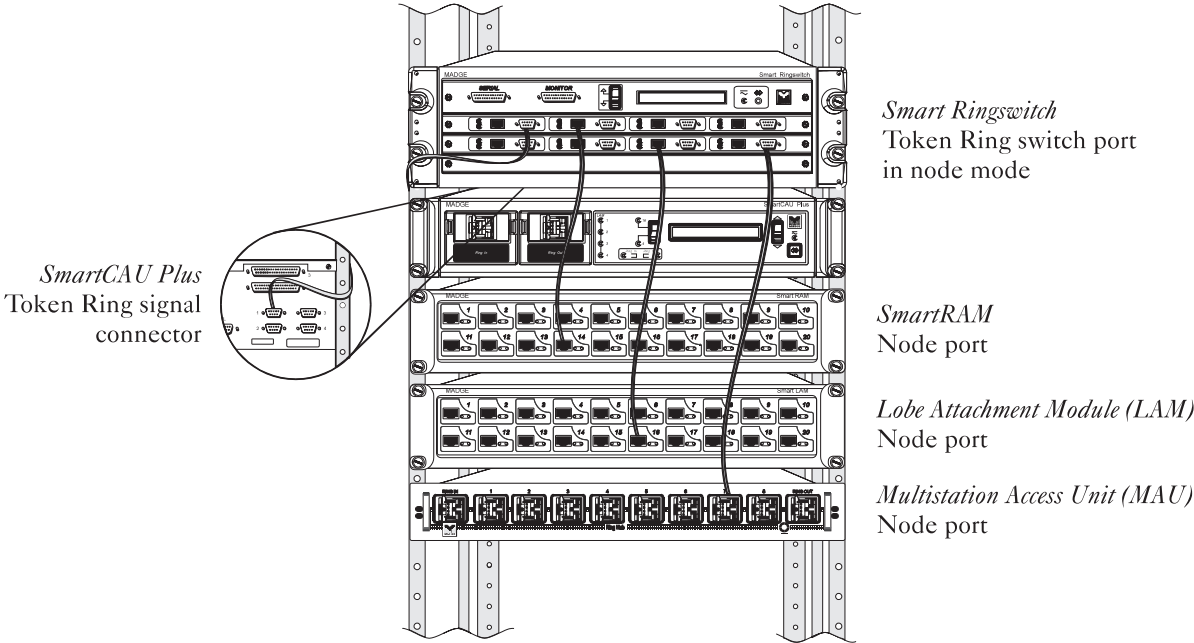


**Note:** When you connect a LAM to the Ringswitch, connect the LAM to a Controlled Access Unit (CAU). If the LAM has LAM management cables, connect the LAM management cables to the CAU.



**Note:** The recommended method for attaching the Smart RAM STP or Smart RAM Plus UTP is to connect a token-ring port in concentrator mode to the access port on the rear of the device.

Figure 3.1     Connecting devices to token-ring ports in node mode



Token-ring  
ports

**Concentrator interface mode**

In concentrator mode, a port behaves like a MAU or LAM port and detects the phantom drive signal that is generated when the connected device attempts to insert. Use concentrator mode to connect token-ring ports as shown in Figure 3.2.

Table 3.2 describes the devices you can connect to a port in concentrator mode.

*Table 3.2 Copper token-ring port in concentrator interface mode*

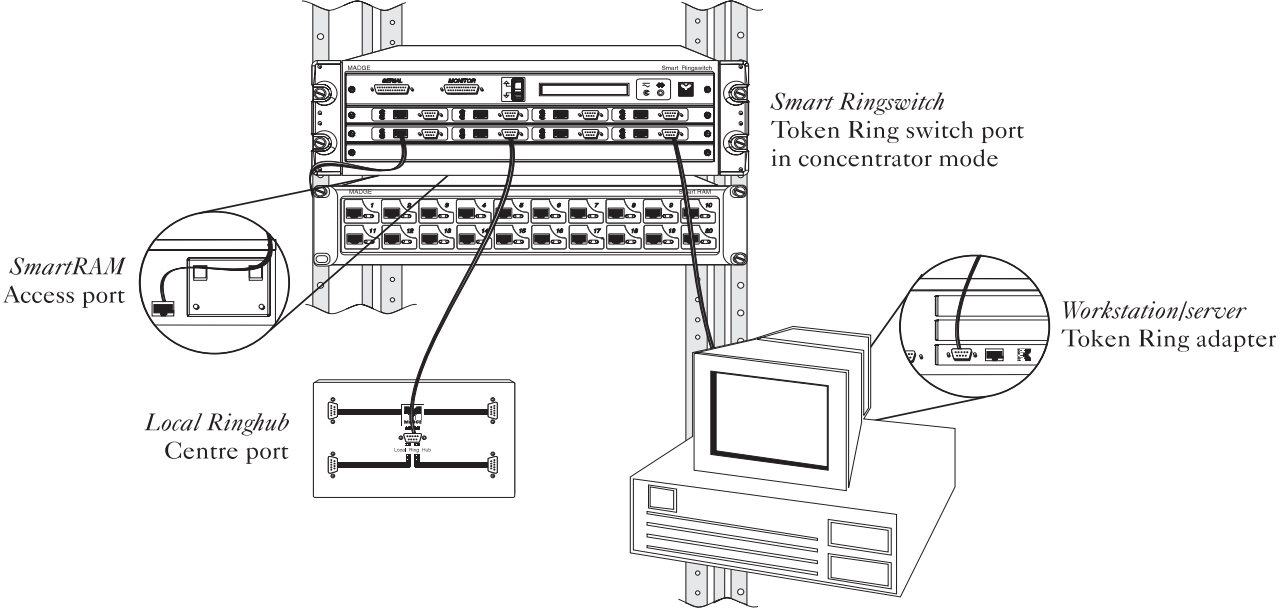
Attached device	Connector on device
Madge Smart RAM Plus UTP or Madge Smart RAM STP	Access port
Madge Local Ringhub	Centre port
Workstation/server	Adapter card



**Note:** Only connect a token-ring port to the centre port of a Local Ringhub. Do not connect to any of the four node ports on a Local Ringhub.

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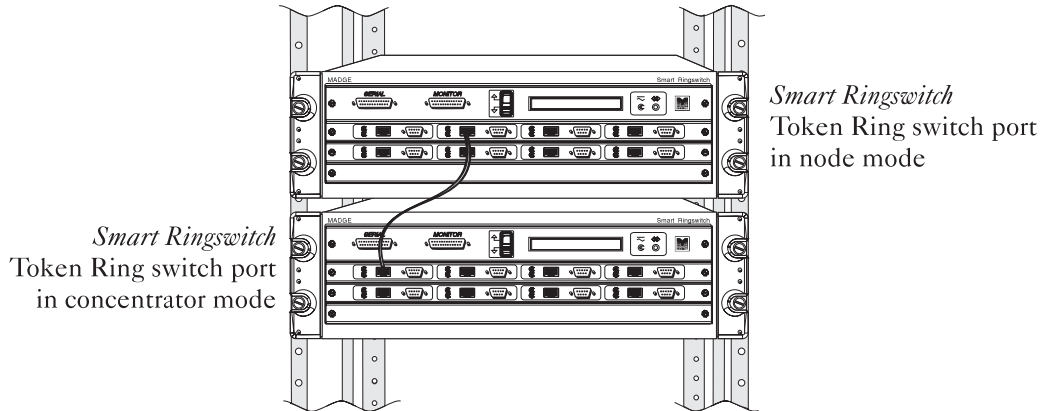
Figure 3.2     Connecting devices to token-ring ports in concentrator mode



### Connecting another Ringswitch

Connect multiple Ringswitch devices by their token-ring ports, with one in concentrator interface mode and one in node interface mode, as shown in Figure 3.3.

*Figure 3.3 Connecting Ringswitch devices together*



When you connect two Ringswitch devices by their token-ring ports, and you are using source-route bridging, make sure the ring number is identical for both ports.

# Connecting fiber token-ring ports

---

There are two fiber token-ring port modules:

- Smart Ringswitch 4-Port TR Fiber Module
- Smart Ringswitch 8-Port TR Fiber Module

Fiber token-ring port modules are optional units that you can use to extend the functionality of the Ringswitch, or to replace existing port modules.

Fiber token-ring port modules meet ANSI/IEEE 802.5j-1997 (published within ISO/IEC 8802-5:1998/Amd.1:1998) and are compatible with the trunk signaling recommendations described in Annex 13.B. Fiber token-ring port modules have either four or eight fiber token-ring ports. Each fiber token-ring port has two female ST optical connectors that you can connect to a wiring concentrator, lobe stations, Smart DeskStream, or another Ringswitch.

You can connect a fiber token-ring port to the following:

- a fiber token-ring port on another Ringswitch
- a Madge Smart CAU Plus with FTL module
- a Madge Smart RAM Plus or Madge Smart RAM Plus UTP with FTL module
- a Fiber LAM (for example, a Raylan LAM)
- an IBM 8230 token-ring CAU or other wiring concentrator conforming to ANSI/IEEE 802.5j-1997
- a workstation/server with fiber-optic token-ring adapter
- Smart DeskStream Token Ring Switch with 16/4 TR Fiber Module

You cannot connect a fiber token-ring port to an HSTR port.

## Selecting the port interface mode

The port interface mode affects how the port behaves, and determines the devices you can connect to the port. Each fiber token-ring port can act in node, concentrator, or CAU RI/RO port interface mode. For information about the port interface modes the Ringswitch provides, and how to configure the port interface mode, see Appendix G, Using the command line interface.

For information on the default state of each token-ring port, refer to “Preparing to use TrueView Ringswitch Device Manager” in Chapter 2, Configuring the Ringswitch.

---

## Connecting devices

Token-ring networks are resilient to the temporary disruption of network signals that occur when nodes insert into and de-insert from the network. Therefore, you do not need to switch off the Ringswitch when connecting and disconnecting cables.

Make sure you:

- configure the token-ring port to support the correct ring speed or you may cause ring disruption or beaconing
- configure the token-ring port for the correct port interface mode
  - connecting a token-ring port in concentrator mode to another device that detects token-ring fiber keys causes the port to remain in the “Ready” state, as shown on the LCD
  - connecting a token-ring port in node mode to another device that generates token-ring fiber keys causes the port to repeatedly fail the open process. The LCD displays the port status as ‘OpenFail’, and the upper LED for the port flashes red

**Node interface mode**

In node interface mode the port behaves like a token-ring station or adapter card and generates ANSI/IEEE 802.5j-1997 signalling keys.

Table 4.1 describes the devices you can connect to a port in node mode.

*Table 4.1 Fiber port in node interface mode*

Attached device	Connector on device
Wiring concentrator, such as a SmartCAU Plus, Controlled Access Unit (CAU) or Multistation Access Unit (MAU)	Fiber-optic port conforming to ANSI/IEEE 802.5j-1997
Fiber LAM (for example, a Raylan LAM)	Fiber-optic token-ring port
Ringswitch	Any fiber token-ring port in concentrator mode
Smart DeskStream Token Ring Switch	Any fiber token-ring port in concentrator mode

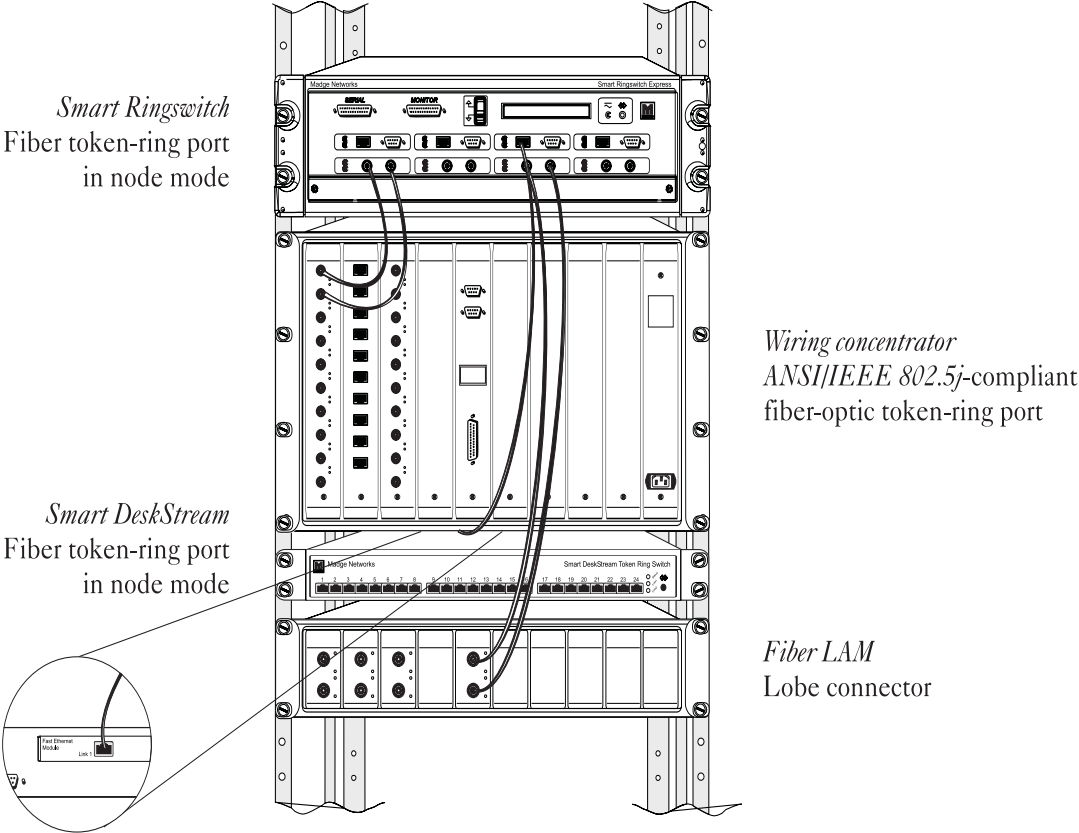
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You can connect a port to a wiring concentrator, such as a Controlled Access Unit (CAU) or Multistation Access Unit (MAU), conforming to ANSI/IEEE 802.5j-1997. Many modern concentrators are designed to ANSI/IEEE 802.5j-1997. The difference between conforming and non-conforming concentrators is in the way the adapter enters the ring.

The ANSI/IEEE 802.5j-1997 standard provides for a loop-back test that enables an adapter card to detect a faulty lobe-cable before entering the ring. If the concentrator does not conform to ANSI/IEEE 802.5j-1997, it may not support the feature, and the adapter will need to perform the loop-back test locally.

Figure 4.1 shows the devices you can connect to a port in node mode.

*Figure 4.1     Connecting fiber ports in node interface mode*



### Concentrator interface mode

In concentrator interface mode, the port behaves like a Lobe Attachment Module (LAM) port and detects the ANSI/IEEE 802.5j-1997 signalling keys that are generated when the connected device attempts to insert.

Table 4.2 describes the devices you can connect to a port in concentrator mode.

*Table 4.2 Fiber port in concentrator interface mode*

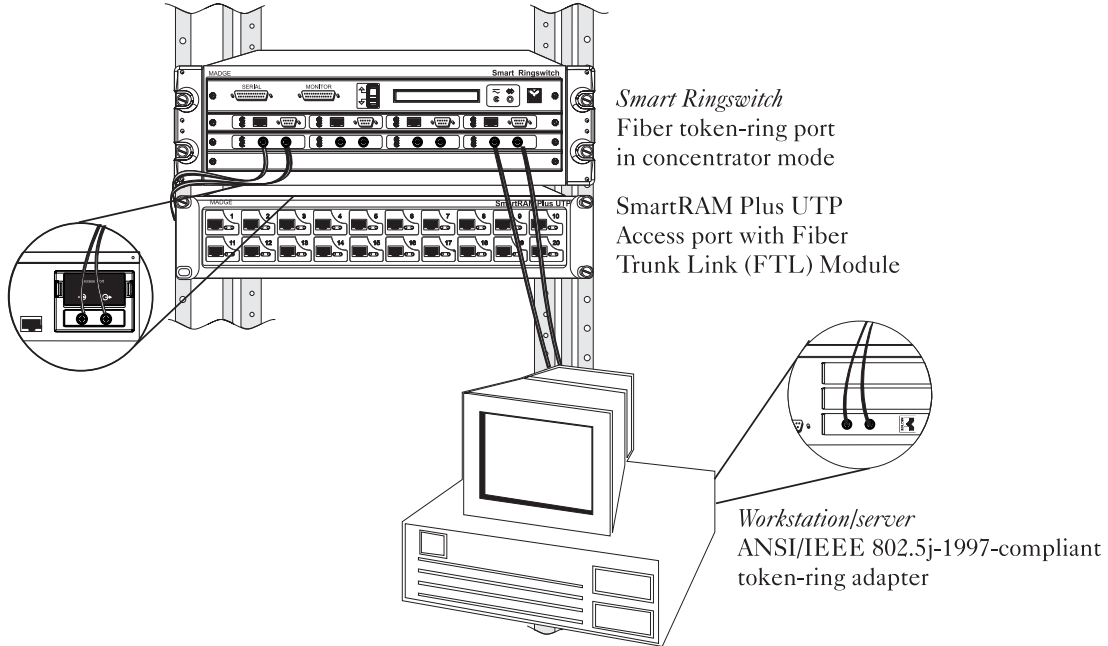
Attached device	Connector on device
Madge Smart RAM Plus UTP or Madge Smart RAM STP	Access port with FTL module
Workstation/server	Fiber-optic Token Ring adapter conforming to ANSI/IEEE 802.5j-1997
Ringswitch	Any fiber token-ring port in node mode
Smart DeskStream Token Ring Switch	Any fiber token-ring port in node mode



**Note:** When you connect a token-ring adapter to a port in concentrator mode, ensure that you close and re-open the port whenever you break the cable that connects the Tx port on the node to the Rx port on the fiber token-ring module. If you break the connection without closing the port, the concentrator port may bypass the node, and you may need to reset the node.

Figure 4.2 shows the devices you can connect to a port in concentrator mode.

*Figure 4.2 Connecting fiber ports in concentrator interface mode*



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**CAU RI/RO interface mode**

The CAU RI/RO port interface mode only applies to fiber token-ring ports. In CAU RI/RO interface mode, the port behaves like the Ring-In (RI) or Ring-Out (RO) port on a Controlled Access Unit (CAU). For example, it enables you to connect to the RI or RO port of a Madge Smart CAU Plus that has a FTL module installed.

The FTL module is an optional unit that extends the functionality of the Madge Smart CAU Plus or Madge Smart RAM Plus UTP. The FTL module has two female ST optical connectors for connection to the main and backup signal cables.



**Note:** You should only use the CAU RI/RO mode to connect the Ringswitch to the RI or RO port of a Madge Smart CAU Plus. To connect the Ringswitch to the access port of a Madge Smart RAM Plus UTP/STP with an FTL Module installed, use concentrator interface mode.

---

The Madge Smart CAU Plus supports dual attachment, so you can improve network resilience by installing FTL modules in both the RI and RO ports, and connecting the ports to two different Ringswitch devices using fiber-optic cable.



**Note:** Fiber token-ring modules do not support the IEEE 802.5c dual-reconfiguring ring feature.

---



**Note:** The lobe test cable checking function of token-ring is disabled in CAU RI/RO mode.

---

Table 4.3 describes the devices you can connect to a port in CAU RI/RO mode.

*Table 4.3 Fiber port in CAU RI/RO interface mode*

Device	Connector on device
Madge SmartCAU Plus	RI or RO on FTL Module
IBM 8230 Token-Ring CAU	RI or RO on Optical Fiber RI/RO Module

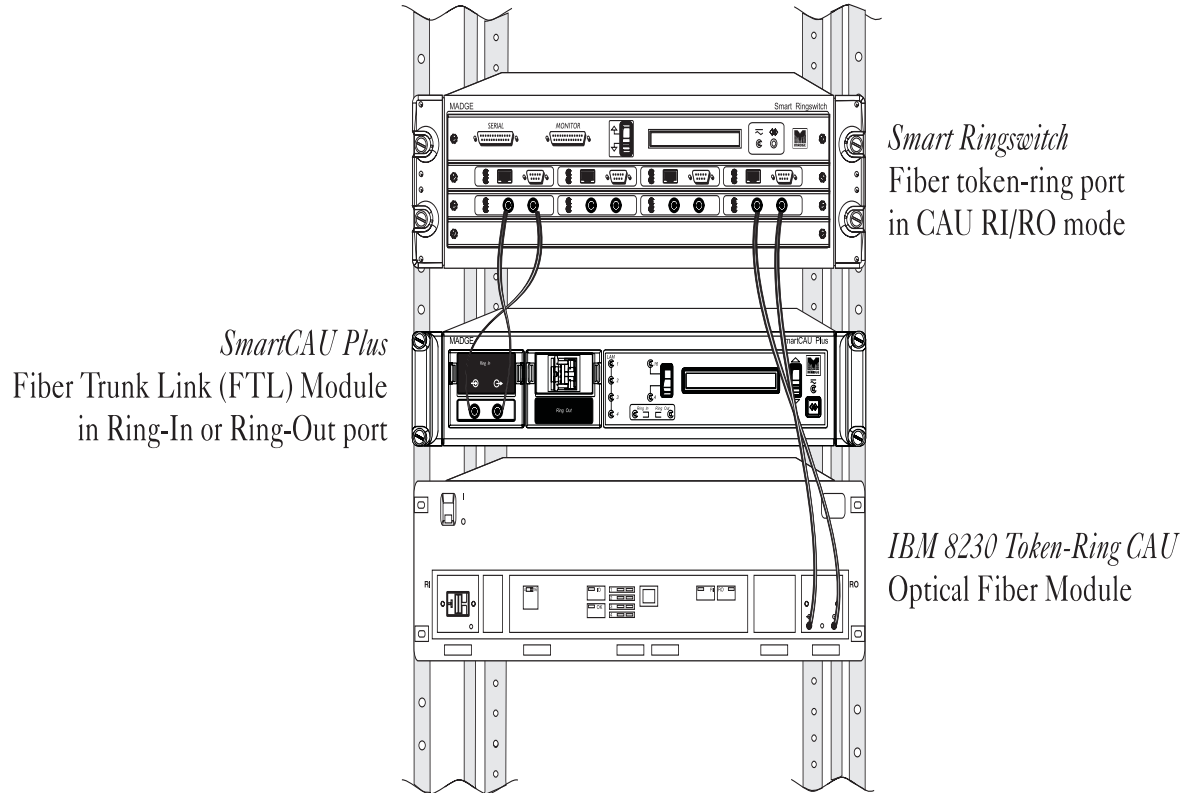


**Note:** You may be able to connect other third-party devices to a port in CAU RI/RO mode. However, only the devices in Table 4.2 have been fully tested for interoperability, and you should use caution when connecting other hardware.

---

Figure 4.3 shows the devices you can connect to a port in CAU RI/RO mode.

Figure 4.3 Connecting fiber ports in CAU RI/RO mode



### **Connecting another Ringswitch**

You can connect multiple Ringswitch devices by fiber token-ring ports, with one in concentrator interface mode and one in node interface mode.

When you connect two Ringswitches by their token-ring ports, and you use source-route bridging, make sure the ring number is identical for both ports.

# Connecting high speed token-ring ports

---

There are four Madge HSTR modules:

- Smart Ringswitch 4-Port HSTR Copper Module
- Smart Ringswitch 2-Port HSTR Fiber Module
- Smart Ringswitch 8-Port HSTR Copper Module
- Smart Ringswitch 8-Port HSTR Fiber Module

This chapter explains how to configure Madge HSTR modules to connect the Ringswitch to workstations, servers, and other Ringswitch devices.

An HSTR module is an optional unit that you use to extend the functionality of the Ringswitch, or to replace an existing Option Module.

The Smart Ringswitch 4-Port HSTR Copper Module has four HSTR ports; the Smart Ringswitch 8-Port HSTR Copper Module has eight HSTR ports. Copper HSTR ports each have an RJ-45 connector for copper UTP cabling. You can use copper STP cabling by using a media converter. Install copper HSTR modules into any of the bottom three slots of the Smart Ringswitch Plus Chassis or into the Smart Ringswitch Express.

The Smart Ringswitch 2-Port HSTR Fiber Module has two fiber HSTR ports; the Smart Ringswitch 8-Port HSTR Fiber Module has eight fiber HSTR ports. Fiber HSTR ports each have an SC (Snap Connection) socket. Install the Smart Ringswitch 2-Port HSTR Fiber Module into any slot of the Smart Ringswitch Plus Chassis or into the Smart Ringswitch Express. Install the Smart Ringswitch 8-Port HSTR Fiber Module into any of the bottom three slots of the Smart Ringswitch Plus Chassis or into the Smart Ringswitch Express.

## Selecting the port interface mode

The port interface mode affects how the port behaves and determines the devices you can connect to the port. Each token-ring port on the Ringswitch can act in full duplex node mode or full duplex concentrator port interface mode. For information about the port interface modes the Ringswitch provides, and how to configure the port interface mode, see Appendix G, Using the command line interface. The default port interface mode of the HSTR module ports on a Ringswitch with a Switch-3 Module installed, is listed below.

### **Smart Ringswitch 4-Port HSTR Copper Module**

- the two left-hand ports are full duplex nodes
- the two right-hand ports are full duplex concentrators

### **Smart Ringswitch 2-Port HSTR Fiber Module**

- the left-hand port is a full duplex node
- the right-hand port is a full duplex concentrator

### **Smart Ringswitch 8-Port HSTR Copper Module**

- the four left-hand ports are full duplex nodes
- the four right-hand ports are full duplex concentrators

### **Smart Ringswitch 8-Port HSTR Fiber Module**

- the four left-hand ports are full duplex nodes
- the four right-hand ports are full duplex concentrators

**Full duplex concentrator interface mode**

In full duplex concentrator interface mode, you can connect to a port on a Madge HSTR module (in another Ringswitch) which has been set to full duplex node interface mode, or you can connect to an HSTR adapter card. If any copper HSTR node applies a phantom drive while inserting into a Ringswitch HSTR concentrator, it will be correctly terminated by the Ringswitch. This enables the node to detect wire fault.

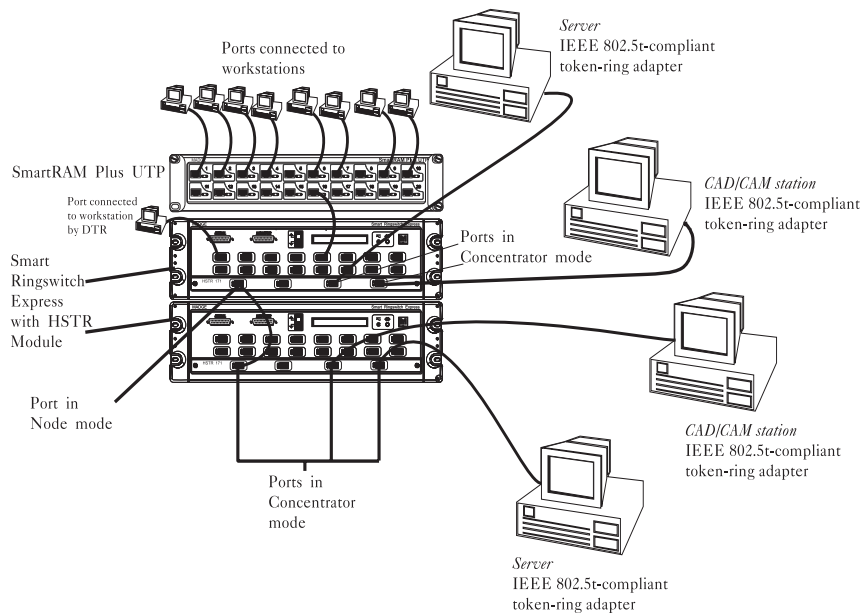
**Node interface mode**

In full duplex node interface mode, the port may be inserted into another Ringswitch HSTR port in full duplex concentrator mode. A Ringswitch port in full duplex mode will not generate a phantom drive.

**Connecting devices**

To connect a workstation or server to a Ringswitch HSTR port, you must set the port to full duplex concentrator mode. To make an HSTR backbone link, set one HSTR port on one Ringswitch to full duplex node interface mode and one HSTR port on another Ringswitch to full duplex concentrator mode and connect the two together. Figure 5.1 shows how to connect devices.

*Figure 5.1 Connecting devices to an HSTR module*



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## Fast Failover

A feature that Madge provides with Ringswitch Software Release 4.0 and later is Fast Failover. This provides increased resilience for an HSTR link between two Ringswitches by combining two parallel connections into one Fast Failover link. Fast Failover is available in all Madge HSTR modules.

To use Fast Failover, you combine two adjacent ports on an HSTR Module as one Fast Failover link going to two adjacent ports on an HSTR module in a different Ringswitch. When you use Fast Failover on the Ringswitch, one port is the active port while the other is the standby port.

If the active port fails, the Ringswitch immediately re-directs frames over the standby port. The failed port now becomes the standby port. The switch-over takes between one and three seconds, which is quick enough to avoid aborts and retries. The standby port adopts all the characteristics and settings of the failed port and enables traffic flow to continue virtually uninterrupted. The Ringswitch will continually attempt to re-open the failed port. If the Ringswitch succeeds, the failed port will remain on standby.

Use TrueView or the Ringswitch LCD display to monitor the status of the Fast Failover link.



**Note:** The Ringswitch does not support Fast Failover links through fiber-to-copper converters (media converter units).

---

### Enabling Fast Failover

Each Fast Failover link requires two adjacent HSTR ports on the same HSTR module. You enable Fast Failover either using the command line (see Appendix G, Using the command line interface) or TrueView.

You can enable Fast Failover on any odd-numbered port (for example Port 1, Port 3, and Port 5). The Ringswitch pairs that port with the next port to the right to create the Fast Failover link. The new combined link adopts the characteristics and settings of the left-hand port. The Ringswitch disables the right-hand port (if it is not already disabled). You must manage the link through the left-hand port.

You do not have to connect the ports in the Fast Failover link to the same port numbers in the terminating HSTR module.

A Ringswitch can have any number of HSTR ports configured in Fast Failover mode.



**Caution:** You must enable Fast Failover on the HSTR ports in both Ringswitches before normal operation will begin.

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## Troubleshooting

### Upgrading flash memory

Madge HSTR modules have a programmable flash memory device to store the programmable hardware image. To upgrade flash memory, use TrueView. If during an upgrade this image becomes invalid, the Ringswitch LCD displays the following error message at regular intervals:

Upgrade S/W slot xx.

In this case, perform the upgrade again.



## Connecting Ethernet ports

---

The Smart Ringswitch 2-Port Ethernet Module enables you to connect your Ringswitch to an Ethernet network. The Translation Bridging solution provided in the Ringswitch allows for “any to any” connectivity permitting Ethernet and token-ring end-stations to talk directly without the need for any special drivers in these end-stations. For more information about the conversion process, see Appendix F, Token ring and Ethernet conversion.

You can install the module into any slot of the Smart Ringswitch Plus Chassis or into the Smart Ringswitch Express.

### Connecting ports

The Smart Ringswitch 2-Port Ethernet Module has two Ethernet ports each with an RJ-45 connector for copper UTP cabling. It is wired as an adapter/workstation.

You can connect an Ethernet port to the following MDI-X devices:

- an Ethernet switch
- an Ethernet hub

By using Ethernet crossover cable, you can connect an Ethernet port to the following MDI devices:

- an Ethernet port on a Smart DeskStream
- an Ethernet port on another Ringswitch
- a workstation with an Ethernet network adapter

*Table 6.1 Physical specification for the Smart Ringswitch 2-Port Ethernet Module*

Copper Interface	Ethernet/IEEE 802.3	
	10BASE-T and 100BASE-TX	10BASE-T
Cable Type	Cat5 UTP	Cat3 UTP
Connectors	Shielded RJ-45	Shielded RJ-45
Port Attributes	Auto-Negotiation enabled Full and Half Duplex	Auto-Negotiation disabled Full and Half Duplex
Port Speed	10Mbit/s or 100Mbit/s	10Mbit/s
Recommended Maximum Cable Length	100m	100m

**Connecting a Smart Ringswitch 2-Port Ethernet Module to any MDI-X device**

When you connect to a standard hub or standard switch configured and marked with “X” you must use straight-through Twisted Pair (TP) cable with RJ-45 connectors. The cables can be shielded or unshielded; we recommend that you use shielded.

A straight-through cable is one where the pins of one connector are connected to the same pins of the other connector.

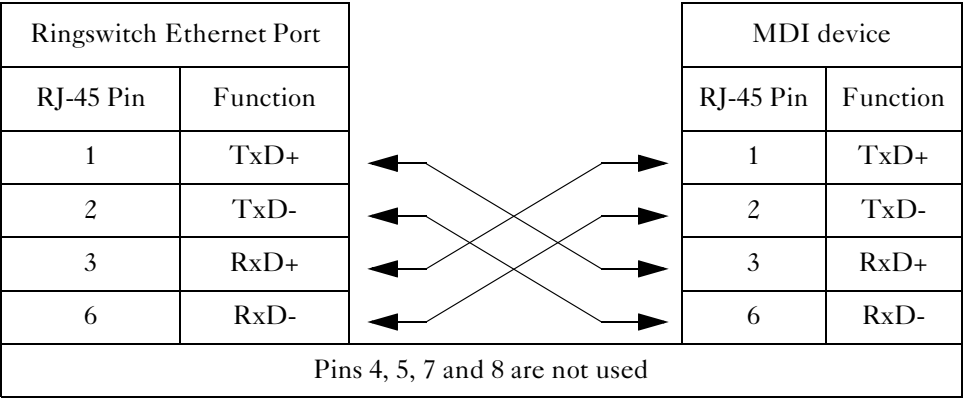
*Table 6.2     Schematic of a straight-through cable*

Ringswitch Ethernet Port				MDI-X device	
RJ-45 Pin	Function			RJ-45 Pin	Function
1	TxD+	←→		1	TxD+
2	TxD-	←→		2	TxD-
3	RxD+	←→		3	RxD+
6	RxD-	←→		6	RxD-
Pins 4, 5, 7 and 8 are not used					

**Connecting a Smart Ringswitch 2-Port Ethernet Module to any MDI device**

When you connect to an adapter/workstation, another Ringswitch, a Smart DeskStream Token Ring Switch, or any printer/scanner device then you must use a crossover cable.

*Table 6.3     Schematic of a crossover cable*



---

## Port interface attributes

### **Speed**

The default setting for the port speed is “Auto”. This means that the port will detect the speed of the Ethernet to which it is connected. You can also set the port speed to either 10 or 100 Mbps.

### **Duplex mode**

The default setting for the duplex mode of the port is “Auto”. This means that the port will detect the duplex mode of the Ethernet to which it is connected. You can also set the duplex mode of the port to “Full-duplex” or “Half-duplex”.



# Configuring the Smart GroupSwitch Module

## About the Smart GroupSwitch Module

The GroupSwitch Module is an optional unit that extends the functionality of the Ringswitch. The GroupSwitch Module enables you to connect the Ringswitch to file servers, routers, or other Ringswitch devices on token-ring networks. The GroupSwitch Module has UTP Connectors and its ports have three modes of operation:

- a five-port port
- an automatic-concentrator
- a full-duplex concentrator

The GroupSwitch Module implements source-route, transparent, source-route transparent bridging, and source-route transparent bridging plus.

The module consists of four GroupSwitch hubs and each GroupSwitch hub has five ports. Each port has a RJ-45 connector for copper UTP cabling.



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**Note:** All ports are concentrators.

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**Note:** When a GroupSwitch port is configured as a full-duplex or Automatic-concentrator, then only the first port on each group of five ports is active. The remaining four ports are inactive.

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**Note:** Only when a node is inserted in a port is its LED on.

---

### Selecting the port interface mode

The port interface mode affects how the port behaves, and determines the devices you can connect to the port. The GroupSwitch module can operate in three modes, where each GroupSwitch port is either a five-port token-ring connector, a 1 port full-duplex concentrator, or a 1 port half-duplex concentrator.

For information about the port interface modes and how to configure the port interface mode, see Appendix G, Using the command line interface.

### Fault finding

Fault finding on the Ringswitch begins after a period of sustained beaconing on the network, or if the port is in the claim-token process continuously. If the beaconing or claim-token process exceeds one second, the faulty node is identified, fault disabled, and removed. This form of node removal is shown by the right LED flashing red.

If the node is re-inserted and re-offends, it is fault disabled and the right LED flashes red. If this event is repeated and the user-set Removal threshold reached, the node will then be management disabled and the left LED will flash green. To enable a management disabled node you must use TrueView. Right click on the port and select GroupSwitch. You see the GroupSwitch Info dialog box. Check the box of the disabled port to re-enable it.

### Fault Manager

There are three ways to control how the Fault Manager deals with a fault: Ignore, Inform, or Remove. If you set the fault manager to Inform, the Alert manager reports the fault in the Alert table when the threshold is reached. If you set the fault manager to remove, the node is removed when the threshold is reached and its LED flashes red.



**Note:** The Fault Manager is disabled if you insert multiple nodes into a port (for example, if you insert a local ringhub into the port).

There are four types of fault each controlled by a user-set threshold:

- Ring Poll Failure - Ring Poll failure requires the ring poll to fail consecutively  $n$  times, where  $n$  is the Threshold set by the user. When the threshold for ring poll failure is exceeded the port is fault disabled. If a good ring poll occurs, the error counter is reset. A 'good ring poll' is defined as no NNNI (Nearest Neighbour Notification Incomplete) Frame sent within a twenty second period. If the node causing the ring poll failure changes, the error counter starts from one again
- Excessive Ring Purging - when the threshold for ring purges is exceeded from the same node within 20 seconds then the port will be fault disabled. If any ring purges are seen from other nodes, the counter is reset
- Excessive Beaconsing - when a block of beaconing occurs from a node, a counter is increased by one. Every 60 seconds this counter is decreased by one. If this counter ever exceeds the threshold, the node is fault disabled
- Isolating Errors - when a Report Soft Error frame is seen on the ring then a node may be fault disabled. If the sum of Internal Error and Abort Transmitted counts exceed the threshold, the reporting node will be fault disabled. If the sum of AC, Burst and Line exceeds the Threshold, the node upstream from the reporting node will be fault disabled



**Note:** We recommend that when the Fault Manager reports that a node is sending isolating errors or ring purges, you set the actions on these two errors to Inform and not Remove.

# Port modes

*Table 7.1     Port Modes*

Port mode	Fault finding	Fault manager
Five port hub	Yes	Yes
Auto-concentrator	No	No
DTR-concentrator	No	No

# Configuring the Smart Ringswitch FDDI Module

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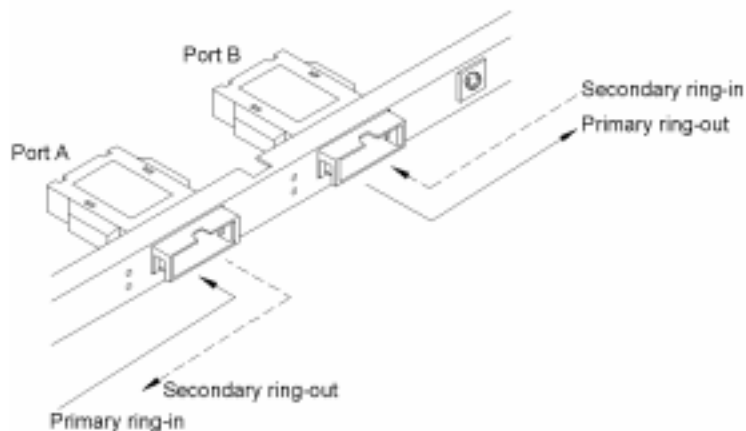
## About the Smart Ringswitch FDDI Module

The FDDI Module is an optional unit that you can use to extend the functionality of the Ringswitch. The FDDI Module enables you to connect the Ringswitch to file servers, routers, concentrators, or other Ringswitch devices, on Fiber Distributed Data Interface (FDDI) networks. The FDDI Module provides dual ISO 9314-3 fiber Media Interface Connectors (MICs) and supports Single Attach or Dual Attach with Dual Homing modes of operation. The FDDI Module implements source-route, transparent, and source-route transparent bridging between token-ring and FDDI networks, and has protocol fixup capabilities to enable the conversion of IP and IPX protocols.

**Fiber MIC connectors**

The FDDI Module has dual fiber MIC connectors that connect the Ringswitch to the media. The MIC receptacles are called Port A and Port B. Port A provides the primary ring-in and secondary ring-out paths, while Port B provides the secondary ring-in and primary ring-out paths.

*Figure 8.1     Dual ring input/output*



**Single Attach or Dual Attach with Dual Homing**

The FDDI Module supports both Single Attach and Dual Attach modes of operation.

- Single Attach Stations (SASs) attach to the primary ring only, and may be isolated from the network if the primary ring fails. SASs must be connected to a concentrator
- Dual Attach Stations (DASs) attach to the primary and secondary rings and, if the primary ring fails, can continue to operate once the ring is reconfigured. DASs can be connected directly to the main ring

The FDDI Module supports Dual Homing, which means you can connect the media interfaces to different concentrators. This provides greater fault tolerance, because if one concentrator fails, the Ringswitch maintains a connection to the network.

**Active bypass support**

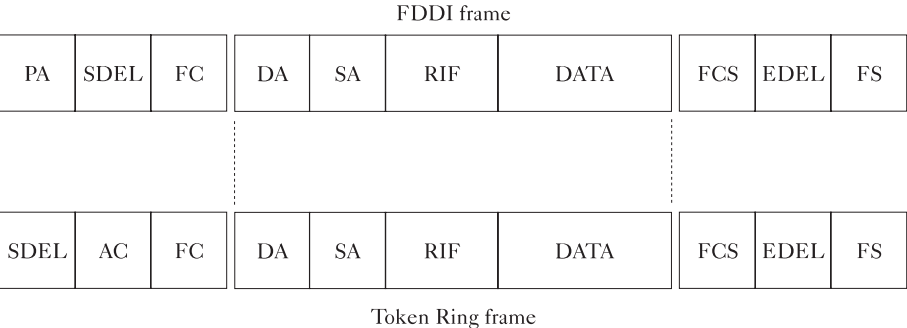
The bypass connector on the fascia of the FDDI Module supports the connection of a bypass switch. When the Ringswitch is switched off or disabled by an internal fault, the bypass switch routes incoming frames directly to the output line by connecting the inbound medium to the outbound medium without forwarding the frames to the isolated FDDI Module. This means that dual-ring operation continues, without requiring the neighboring stations to reconfigure the FDDI ring.

# Bridging and the FDDI Module

The FDDI Module supports standard source-route transparent bridging between 802.5 token ring and FDDI. There is no conversion performed between source-routed and transparent frame formats. To allow connectivity between FDDI stations and token-ring stations across the Ringswitch, configure all the communicating stations to support source-routing or transparent frame formats as appropriate.

Token ring and FDDI have different rules for frame format and frame size, so the Ringswitch converts the frame format when passing a frame from one type of network to the other.

*Figure 8.2     Token-ring and FDDI frame formats*



When bridging from token-ring to FDDI networks, the Ringswitch converts the frame format between IEEE 802.5 for token ring and ISO 9314 (with the addition of the RIF) for FDDI, as follows:

- 1 The Ringswitch strips the Starting Delimiter (SDEL), Access Control (AC), Frame Copied (FC), Frame Check Sequence (FCS), Ending Delimiter (EDEL), and Frame Status (FS), and only the Destination Address (DA), Source Address (SA), Routing Information Field (RIF), and data (DATA) fields are bridged.
- 2 The Frame Control (FC) field has a different meaning for token-ring and FDDI frames, so the Ringswitch converts the FC field when it bridges between different types of network. The Ringswitch changes the FC of a token-ring frame to 50h (asynchronous LLC frame with 48-bit addressing) when bridging to FDDI.
- 3 The Ringswitch adds the Preamble (PA), SDEL, FCS, EDEL, and FS fields to the frame, and the protocol fixup engine (see IP and IPX protocol fixup capabilities, later in this chapter) may modify the LLC field.
- 4 For an LLC frame, the Ringswitch resets the A and C bits.
- 5 The Ringswitch recalculates the FCS.

The maximum frame size that can be bridged from token ring to FDDI is 4491 bytes. The maximum FDDI data field size, as specified in IEEE 802.1d, of 4399 bytes corresponds to a size 3 token-ring frame. However, some token-ring adapters set the size of the information field in a size 3 frame to 4472 bytes, which means a frame with a Routing Information Field (RIF) is too large to fit in a FDDI frame. If adapters on the ring use frame sizes different to those specified in IEEE 802.1d, use TrueView Ringswitch Manager to change the maximum frame size to accommodate the larger frames. For information about TrueView Ringswitch Manager, refer to the booklet accompanying the Smart Ringswitch CD.

## IP and IPX protocol fixup capabilities

Protocols like IP and IPX store MAC addresses canonically in FDDI frames and non-canonically in token-ring frames. The FDDI Module can ‘fix up’ IP and IPX frames by reading the protocol and locating embedded MAC addresses within the protocol header or the data field. This enables the Ringswitch to translate the bit order from canonical to non-canonical, or vice-versa, depending on the direction in which the frame is being bridged.



**Note:** Make sure the protocol fixups setting is the same for all the Ringswitch devices on the same LAN.

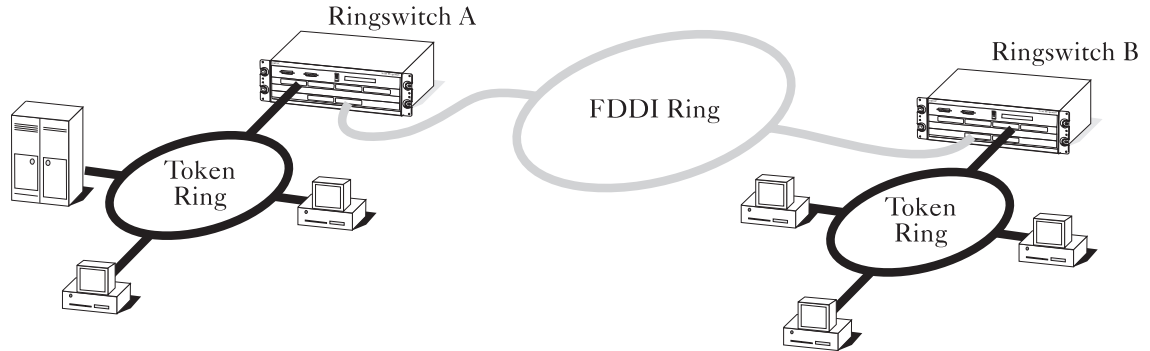
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To enable or disable protocol fixups use one of the following methods:

- connect a terminal to the serial port on the front of the Ringswitch, and enter the `enable port fixups` or `disable port fixups` serial management command. For more information see Appendix G, Using the command line interface
- use TrueView Ringswitch Manager. For information about TrueView Ringswitch Manager, refer to the booklet accompanying the Smart Ringswitch CD

If you use the module to connect the Ringswitch to another Ringswitch over a FDDI backbone, and you do not connect the Ringswitch to other devices on FDDI networks, make sure protocol fixups are disabled. In Figure 8.3, protocol fixups are disabled and the FDDI interface functions in the same way as a token-ring port. This enables the workstations and servers connected to Ringswitch A to communicate with token-ring stations connected to Ringswitch B.

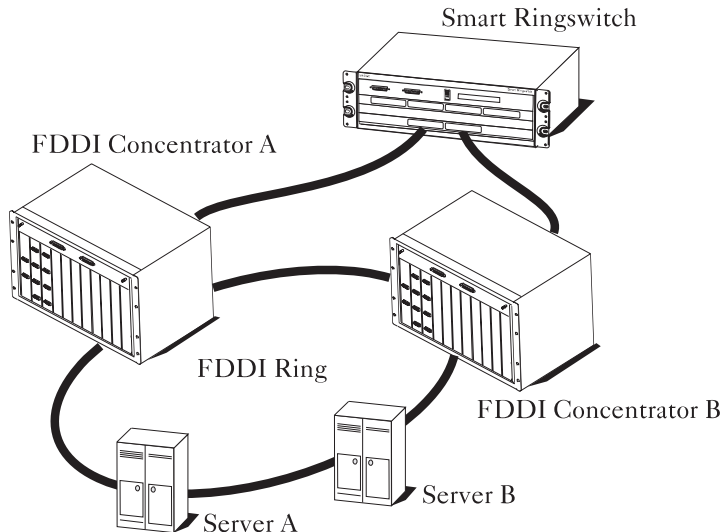
Figure 8.3 Connecting Ringswitch devices with a FDDI backbone



**Note:** Disabling protocol fixups improves the performance of the Ringswitch, but prevents communication between workstations and servers connected to token-ring networks and stations on FDDI networks.

To provide communication between devices on token-ring networks and FDDI networks, enable protocol fixups. In Figure 8.4, protocol fixups enable communication between token-ring stations connected to the Ringswitch, and stations and NetWare servers on the FDDI ring.

*Figure 8.4    Connecting the Ringswitch to FDDI concentrators*



When you enable protocol fixups, enable them for every Ringswitch on the same LAN.



**Caution:** If you have multiple Ringswitch devices with FDDI Modules installed, enable protocol fixups on the Ringswitch furthest from the management station first, and the Ringswitch closest to the management station last. For example, if you change the settings for a Ringswitch that connects the management station to the network, you will be unable to communicate with subsequent Ringswitch devices to enable protocol fixups.

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# Configuring the Smart Ringswitch ATM Module

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## About the Smart Ringswitch ATM Module

The ATM Module is an optional unit used to extend the functionality of the Ringswitch. It enables you to connect token-ring LANs to a high-speed ATM Network, thereby giving token-ring workstations access to ATM-based resources.

The ATM module provides a dual redundant OC-3 STS-3c/STM-1 155Mbps connection supporting ATM Forum specified LAN Emulation. Madge supplies two versions of the module: the MMF (Multi-Mode Fiber) and SMF (Single-Mode Fiber) modules each have two female full duplex SC (Snap Connection) sockets. The ATM module implements source-route transparent bridging between token-ring and ATM networks.

### Physical and bridging interfaces in the ATM Module

The ATM Module enables you to connect bridging ports into an ATM network through a single physical interface. To connect bridging ports the ATM Module supports multiple LAN Emulation Clients (LECs) and by assigns a virtual bridge port to each of these LECs.

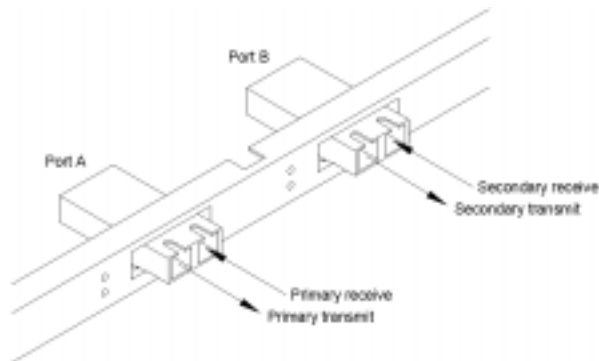
A bridging port is a channel which the Ringswitch forwards data to or from. A physical interface is the Ringswitch's connection to a particular physical network. There may be more than one bridge port per physical interface. For example, each ATM module consists of a single physical interface but may connect to a number of different emulated LANs, each of which will have its own bridging port on the switch.

Each ATM Module can support up to sixteen LECs, each of which provides a bridging port to interface with the ATM network.

### **SC connections**

The ATM Module has dual fiber SC connectors that connect the Ringswitch to the media. The connections support MMF and SMF options.

*Figure 9.1     Dual SC connectors*



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## Token-ring to ATM bridging

The ATM Module is an ATM edge device running LAN Emulation (LANE) that switches token-ring encapsulated frames to and from the ATM network. The ATM module can communicate with other ATM devices running LANE. It supports source routing, transparent bridging, and source-route transparent bridging between itself and:

- ATM endstations running token-ring LANE
- ATM endstations running Ethernet LANE
- other edge devices running Ethernet LANE
- other edge devices running token-ring LANE
- other Ringswitches with ATM Modules



**Note:** For transparent and source-route transparent bridging of LLC frames between token ring and ATM, you must install a Switch-2 Module or Switch-3 Module in the Ringswitch. For advice on identifying Switch Modules, see Chapter 1, Introduction to the Smart Ringswitch Family.

---

### Token-ring LANE

Token ring and ATM use different addressing schemes and frame formats. Token-ring frames are encapsulated within ATM LANE frames. This process is performed by the LEC that resides in the ATM device.

The LEC inside the ATM Module is responsible for:

- 1 Resolving the destination of the token-ring frame to an ATM Address.
- 2 Creating a Switched Virtual Circuit (SVC) between the source and destination ATM devices.
- 3 Encapsulating the token-ring frame, segmenting the encapsulated frame into 53 byte cells, and transmitting the ATM cells.
- 4 Receiving ATM cells, re-assembling them, and unencapsulating the token-ring frame.

## **Ethernet LANE**

Ethernet and ATM use different addressing schemes and frame formats. Ethernet frames are encapsulated within ATM LANE frames. This process is performed by the LEC that resides in the ATM device.

The LEC inside the ATM Module is responsible for:

- 1    Using Translational Bridging to change the frame from token-ring format to Ethernet format. This involves a number of changes. For more information, see Appendix F, Token ring and Ethernet conversion.
- 2    Resolving the destination of the Ethernet frame to an ATM Address.
- 3    Creating a Switched Virtual Channel (SVC) between the source and destination ATM devices.
- 4    Encapsulating the Ethernet frame, segmenting the encapsulated frame into 53 byte cells, and transmitting the ATM cells.
- 5    Receiving ATM cells, re-assembling them, and unencapsulating the Ethernet frame.
- 6    Translational Bridging of the Ethernet frame into a token-ring frame, ready for transmission across the Ringswitch.

**Detail on Token-ring LANE***Figure 9.2     ATM and token-ring LANE frame formats*

LE	AC	FC	DA	SA	RIF	DATA	AAL5 PAD	CTRL	LGTH	CRC
----	----	----	----	----	-----	------	----------	------	------	-----

*Figure 9.3     Token-ring frame format*

SDEL	AC	FC	DA	SA	RIF	DATA	FCS	EDEL	FS
------	----	----	----	----	-----	------	-----	------	----

These mechanisms take place at layer 2 of the ISO OSI 7-layer model: that is beneath protocols such as IP and IPX. This means that LAN Emulation (LANE) is completely transparent to the higher level protocols. As far as a network protocol is concerned, a token ring on an Emulated LAN (ELAN) is communicating directly with other token-ring network adapters.

The bridging process from token-ring to ATM networks can be summarized as follows:

- 1 The token-ring packet is passed down to the LEC.
- 2 If the packet does not contain a Routing Information Field (RIF) then the destination MAC address is extracted and resolved to an ATM address of a LEC in either an ATM endstation or in a transparent bridge edge device. A LEC indicates that it is part of a transparent bridge by registering as a proxy device.
- 3 If the packet contains a RIF, the next hop following the ATM ring number is extracted from the RIF. This next hop is resolved to the ATM address of a LEC within a source routing edge device that has registered the next hop as being attached to it. If no next hop exists (that is the RIF terminates on the ATM network) then the MAC address is used to resolve the destination ATM address.

- 4    The resolution of a MAC address or a next hop ring to an ATM address is performed by the LES. Upon joining an ELAN, a LEC registers with the LES indicating its ATM and MAC address. At registration a LEC can also indicate that it is a transparent bridge by registering as a proxy. Following the initial registration, if the LEC is part of a source routing edge device, it can register with the LES the ring numbers of those rings that are directly attached to the ports of the device.
- 5    If an SVC does not already exist, the LEC creates an SVC between itself and the destination ATM address.
- 6    The token-ring packet is encapsulated and passed down to the SAR layer which splits the packet down in to multiple 53 byte cells and transmits the individual cells.
- 7    At the destination, the cells are re-assembled, and the reconstituted packet passed to the LEC where it is de-encapsulated. If the destination MAC address is that of the LEC, then the packet is passed to the higher layer software for decoding and processing. If the LEC is part of an edge device, then the packet is forwarded to another port on the device.

The maximum frame size that can be bridged from token ring to ATM is 18k, which includes the RIF. The ATM module can support up to 16 LECs, each of which acts as a separate bridge port to the ATM network within the Ringswitch. The ATM adapter does not provide any LANE services. For more information on LANE, see the section “LAN Emulation Fundamentals” later in this chapter.

**Detail on Ethernet LANE***Figure 9.4     ATM Ethernet LANE frame format*

LE	DA	SA	TYPE/ LENGH	DATA	ETHERNET PAD	AAL5 PAD	CTRL	LGTH	CRC
----	----	----	----------------	------	-----------------	-------------	------	------	-----

*Figure 9.5     Token-ring frame format*

SDEL	AC	FC	DA	SA	RIF	DATA	FCS	EDEL	FS
------	----	----	----	----	-----	------	-----	------	----

The bridging process from token-ring to ATM networks running Ethernet LANE can be summarized as follows:

- 1 The token-ring frame is passed down to the LEC.
- 2 The destination and source MAC address are changed from non-canonical (token ring) to canonical (Ethernet).
- 3 If the packet contains a Routing Information Field (RIF), it must be removed because Ethernet uses transparent bridging. The RIF is removed and cached alongside the source MAC address.
- 4 The frame is changed to the correct frame type, and other specific Ethernet requirements are met. See Appendix F for details.
- 5 The MAC address (now in canonical format) is extracted and resolved to an ATM address of a LEC in either an ATM endstation or in a transparent bridge edge device. A LEC indicates that it is part of a transparent bridge by registering as a proxy device.
- 6 The resolution of a MAC address is performed by the LES. Upon joining an ELAN, a LEC registers with the LES indicating its ATM and MAC address. At registration a LEC can also indicate that it is a transparent bridge by registering as a proxy.
- 7 If an SVC does not already exist, the LEC creates an SVC between itself and the destination ATM address.

- 8    The Ethernet packet is encapsulated and passed down to the SAR layer which splits the packet down into multiple 53 byte cells and transmits the individual cells.
- 9    At the destination, the cells are re-assembled and the reconstituted packet passed to the LEC where it is de-encapsulated. If the destination MAC address is that of the LEC, then the packet is passed to the higher layer software for decoding and processing. If the LEC is part of an edge device, then the packet is forwarded to another port on the device.

The maximum frame size used on LANE over Ethernet to ATM is 1516 bytes.

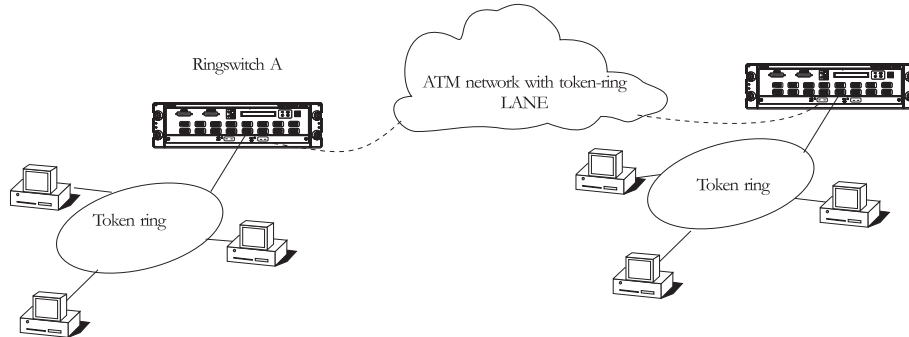
## Connecting devices to ATM ports

The ATM Module can be connected to any ATM Switch whose port supports:

- 155Mbps network speed
- UNI (User Network Interface) 3.0 or 3.1
- SONET or SDH framing
- ILMI

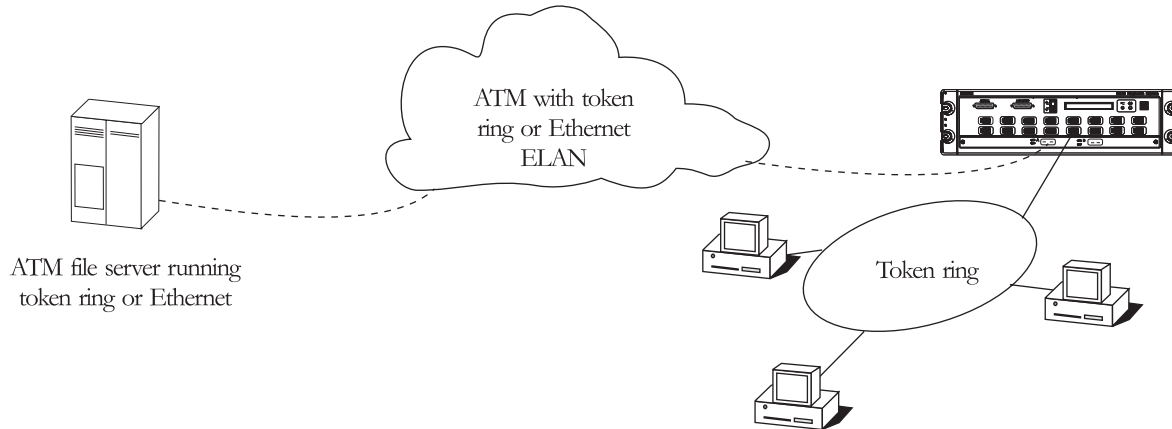
Integrating LANs into a high speed ATM network presents a range of possible applications. For example, token-ring based stations existing on multiple Ringswitches can be connected across an ATM network.

*Figure 9.6    Connecting Ringswitch devices with an ATM backbone*



Switching via the ATM Module, token-ring based stations can also have access to ATM-based resources, such as file servers.

*Figure 9.7     Connecting Ringswitch devices to an ATM server*



## LAN Emulation fundamentals

LAN Emulation consists of four main software processes. The first of these is the LEC. The LEC is used in any device that provides an interface into the ATM network, such as a PC or workstation that has an ATM module. It is also used in a token-ring switch that has an ATM uplink. The LEC in the Ringswitch resides in the ATM Module, and this resolves MAC to ATM addresses (or next hop ring to ATM addresses) and performs the required SAR functions (see the section on “Token-ring to ATM bridging” earlier in this chapter). The other three services that make up LANE are the LAN Emulation Server (LES), the LAN Emulation Configuration Server (LECS), and the Broadcast and Unknown Server (BUS).

---

**LAN Emulation Server (LES)**

The LES maintains a list of all active LECs on the ATM network, as well as their associated MAC addresses. If the LEC is a port on a bridging device, then the LEC can register as a proxy indicating that it is a transparent bridging port. If a token-ring LEC is part of a source routing bridge, it can register the ring numbers directly attached to the other ports of the bridge.

**LAN Emulation Configuration Server (LECS)**

Before a LEC can join an emulated LAN, it must get the ATM address of the LES from the LECS. The LECS decides which LES to direct a LEC to on the basis of the information that the LEC gives it. For example, the LEC may provide the name of the emulated LAN it expects to join.

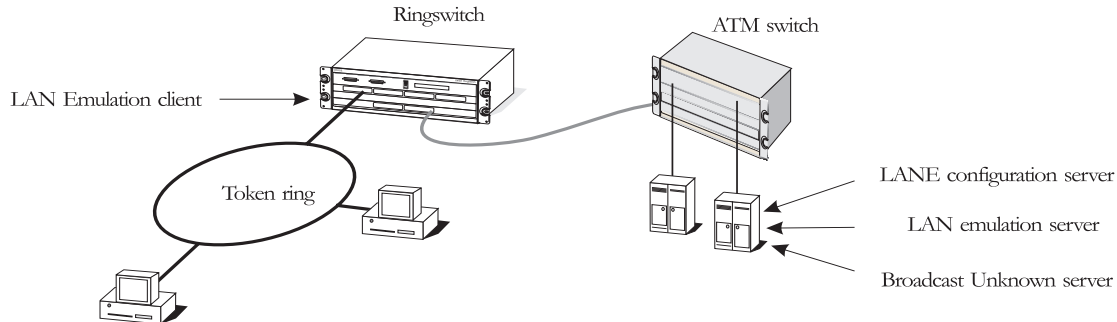
**Broadcast Unknown Server (BUS)**

If the LEC wants to send a broadcast or multicast packet it sends it to the BUS. This is because an ATM network is a connection oriented network, and it does not have a mechanism that provides “many-to-many” distribution. Instead, all multicast frames are transmitted via a single central point: the BUS. The BUS has already created a connection to every LEC on the network, so it sends the broadcast back out to every machine.

**Location of LANE components**

The ATM Module does not provide any LANE services. Therefore the LES, BUS, and LECS processes need to reside on hosts that are easily accessed by all the LECs. They may be located on the same host, or different hosts, and can run on any device that is attached to the ATM network, which might be an ATM switch, a dedicated PC, workstation, or server.

*Figure 9.8 An example of LAN Emulation processes in an integrated LAN token-ring environment*



**Note:** Madge recommends that LANE components are located within an ATM switch.

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# Configuring the Smart Ringswitch TLS Module

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The Smart Ringswitch TLS Module is an optional unit which adds Third Layer IP Services to the Smart Ringswitch Plus or Ringswitch Express. This Option Module enables IP traffic to be routed between subnets without the need of a router thus reducing unnecessary traffic across the network. This Option Module also provides services such as enhanced ABC IP frame filtering with support for RIP, OSPF, VRRP, BootP/DHCP Relay Agent, and VLANS. It enables the forwarding of frames using IP addresses rather than Level 2 addresses which are used by bridging.

## Smart Ringswitch TLS Module

The Smart Ringswitch TLS Module does not have physical ports. Instead it allows you to create and connect up to sixteen IP subnets to the Ringswitch. The Smart Ringswitch TLS Module communicates with the bridging function of the Ringswitch via internal leg ports (sometimes known as virtual ports). The Smart Ringswitch TLS Module supports the following bridging techniques to its leg ports:

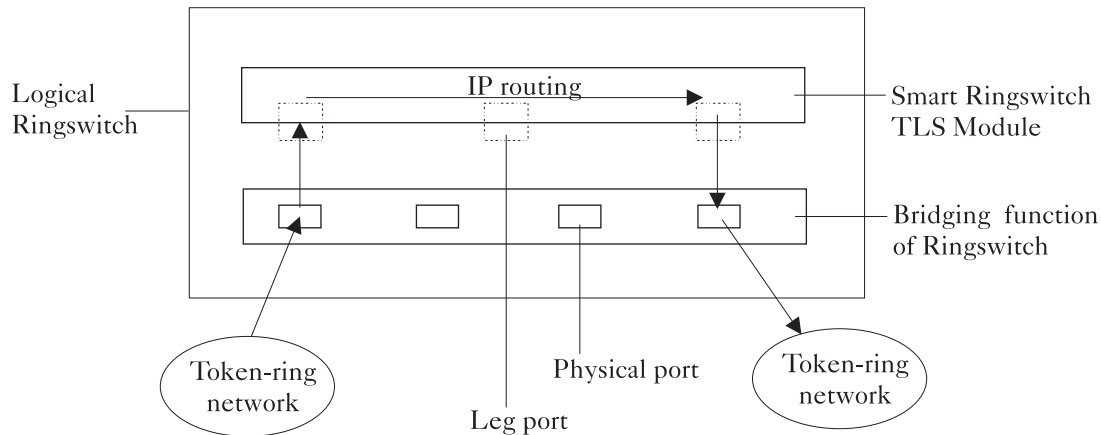
- Source-Route Bridging
- Transparent Bridging
- Source-Route Transparent Bridging

With a Smart Ringswitch TLS Module in your Ringswitch, the path of an IP frame will be as follows:

- 1 From the token-ring network, via a physical port, into the bridging function of the Ringswitch.
- 2 From the bridging function, via an internal leg port, into the Smart Ringswitch TLS Module.
- 3 The Smart Ringswitch TLS Module routes the frame to the destination internal leg port.
- 4 From the Smart Ringswitch TLS Module, via the destination internal leg port, to the bridging function.
- 5 From the bridging function, via a physical port, to the token-ring network.

Figure 10.1 shows the path of an IP frame through a Ringswitch as a logical network entity.

*Figure 10.1 Path of an IP frame through a Ringswitch*



## IP subnet configuration

The Smart Ringswitch TLS Module supports the connection of the Ringswitch to up to sixteen IP subnets. For each IP subnet to be supported, you must configure a leg port (a virtual port) in the Smart Ringswitch TLS Module with the IP subnet information and a list of physical ports that belong to this IP subnet. The IP subnet group is used to limit the bridging of IP control traffic (for example, ARP, RIP, OSPF) only to other ports within the IP subnet group. The additional filtering mechanisms supported by the Ringswitch, for example VLAN and ABC filtering, work independently of this IP subnet group control mechanism and are supported by the Smart Ringswitch TLS Module.

To configure the Smart Ringswitch TLS Module, you use either TrueView Ringswitch Manager or the command line interface. For information about the command line interface, see Appendix G, Using the command line interface.



**Note:** When you have configured IP subnets, the Ringswitch stops IP switching on all ports which are not included in an IP subnet.

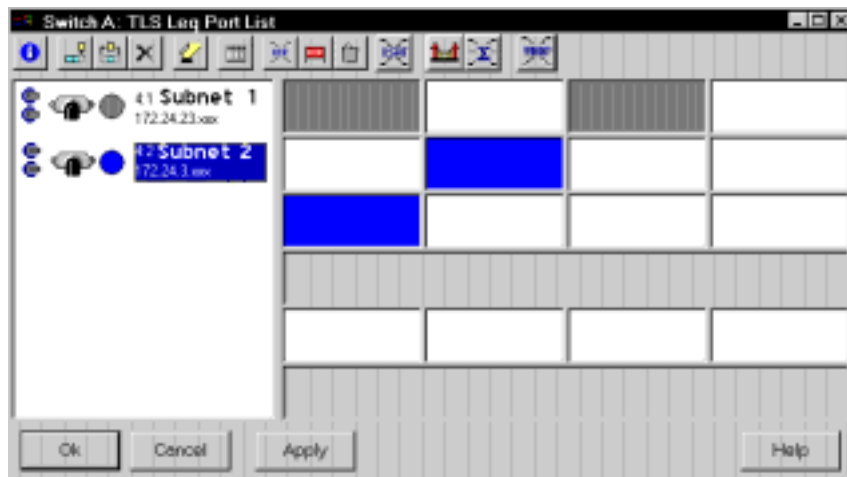
### Configuring IP subnets using TrueView

In the Trueview Ringswitch Manager the TLS Interface Port List represents physical ports on the Ringswitch. To differentiate between IP subnets, Trueview Ringswitch Manager gives each subnet a color.

Figure 10.2 shows a simple IP subnet configuration on a Smart Ringswitch Plus. This Ringswitch contains Smart Ringswitch 4-Port TR Copper Modules in Slots 1, 2, 3, and 5. It also contains a Smart Ringswitch TLS Module in Slot 4 and Slot 6 is empty. The Smart Ringswitch TLS Module is configured to route between two IP subnets, Subnet 1 and Subnet 2. IP hosts for Subnet 1 are located on LANs attached to Ringswitch Ports 1:1 and 1:3. IP hosts for Subnet 2 are located on LANs

attached to Ringswitch Ports 2:2 and 3:1. The Smart Ringswitch TLS Module is configured with two leg ports. One is configured as an IP gateway for Subnet 1, and contains Ports 1:1 and 1:3 in its subnet group. The other is configured as an IP gateway for Subnet 2, and contains Ports 2:2 and 3:1 in its subnet group.

*Figure 10.2    Simple subnet configuration*

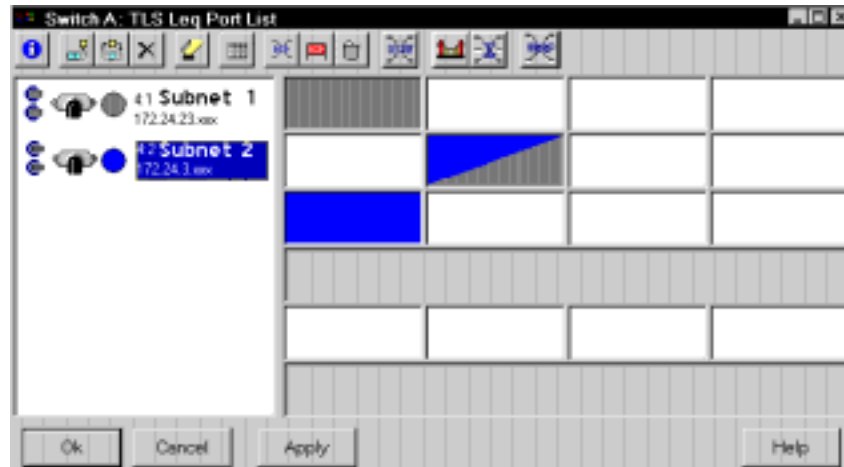


**Note:** The Smart Ringswitch TLS Module is not visible in the TLS Interface Port List because it has no physical ports.

Figure 10.3 shows a more complex subnet configuration. This Ringswitch contains Smart Ringswitch 4-Port TR Copper Modules in Slots 1, 2, 3, and 5. It also contains a Smart Ringswitch TLS Module in Slot 4.

A physical port may be present in multiple IP subnet groups. This allows hosts from different IP subnets to reside on a single physical LAN. In this example, the TLS Interface Port List represents a Smart Ringswitch Plus which is configured to route between two IP subnets, Subnet 1 and Subnet 2. IP hosts for Subnet 1 are located on LANs attached to Ringswitch Ports 1:1 and 2:2. IP hosts for Subnet 2 are located on LANs attached to Ringswitch Ports 2:2 and 3:1. The Smart Ringswitch TLS Module is configured with two leg ports. One leg port is configured as an IP gateway for Subnet 1 and contains Ports 1:1 and 2:2 in its subnet group. The other leg port is configured as an IP gateway for Subnet 2 and contains Ports 2:2 and 3:1 in its subnet group.

*Figure 10.3    Complex subnet configuration*



## Configuring the Smart Ringswitch TLS Module

To configure RIP, OSPF, VRRP, BootP/DHCP Relay Agent, or static routes, you must use either the command line or TrueView; Madge recommends that you use TrueView. For detailed information about using TrueView, refer to the online help. For information about using RIP, OSPF, VRRP, and BootP/DHCP Relay Agent, see Appendix A, Network design issues.

## Reading status indicators

---

The Ringswitch indicates status information on its LEDs and displays information on its LCD. Alternatively, view the LEDs and LCD display from the management station, by running TrueView Ringswitch Manager. For more information on how to run the TrueView Ringswitch Manager, refer to the booklet accompanying the Smart Ringswitch CD.

### Reading LEDs

Each port has a LED which indicates its status.

#### Reading the system status LED

The Ringswitch has a system status LED near the Reset button, which indicates whether the Ringswitch passed the start-up self-test. The LED displays the information in Table 11.1.

*Table 11.1    System status LED states*

LED state	Description
green	Ringswitch is operating normally
red	A system self-test failure occurred
yellow	This is a warning condition. The Ringswitch failed one or more non-critical tests during the start-up sequence

**Reading token-ring port LEDs**

Each token-ring port has two LEDs, which indicate the status, mode, and ring speed of the port. The lower LED displays the information in Table 11.2.

*Table 11.2 Lower LED states for token-ring ports*

LED state	Description
green	Port is configured for node mode at 16 Mbps, or 100Mbps on HSTR ports
green flashing	Port is configured for node mode at 4 Mbps
yellow	Port is configured for concentrator mode at 16 Mbps, or 100Mbps on HSTR ports
yellow flashing	Port is configured for concentrator mode at 4 Mbps
red flashing	Port has failed to open, or has closed unexpectedly
off	Port is disabled

When the lower LED denotes that the port is open, the upper LED provides the information in Table 11.3. Note that the upper LED states are identical for token ring and FDDI ports.

*Table 11.3 Upper LED states for token-ring and FDDI ports*

LED state	Description
off	Bridging is not active and the Ringswitch cannot be managed via this interface
green	Port is open and forwarding frames in all requested forwarding modes
yellow	There is no forwarding requested on this port, or some of the requested forwarding is not active. Source route bridging will fail to become active when requested if the port fails its source route bridge test. Transparent bridging will fail to become active if the spanning tree protocol detects a loop in the network. Note that if the user has requested both source route and transparent bridging on a port the LED will be yellow if either fail to become active

**Reading FDDI port LEDs**

Each FDDI port has two LEDs that indicate the status of the port. The lower LED displays the information in Table 11.4 (when the lower LED is green, the upper LED provides the information in Table 11.3).

*Table 11.4    Lower LED states for FDDI ports*

LED state	Description
red	Port is not connected
green	Port is open
yellow	Port is twisted. This means the cables are connected incorrectly. For example, port type A of a dual attach station is connected to port type A on the FDDI module
off	Port is disabled

**Reading ATM port LEDs**

Each ATM port has two LEDs that indicate the status of the ATM interface. The lower LED displays the information in Table 11.5.

*Table 11.5 Lower LED states for ATM ports*

LED state	Description
flashing yellow	Interface is attempting to connect to the ATM switch
red	Interface has failed to connect to the ATM switch
green	Interface has successfully connected to the ATM switch
yellow	Interface is enabled but not currently active
off	The physical interface is disabled

---

When the lower LED is green, the upper LED provides the information in Table 11.6.

*Table 11.6 Upper LED states for ATM ports*

LED state	Description
off	No LECs are currently open or forwarding
green	Port is open and forwarding frames in all requested forwarding modes
yellow	There is no forwarding requested on any LEC/bridge port on this module, or some of the requested forwarding is not active. Source route bridging will fail to become active when requested if the port fails its source route bridge test. Transparent bridging will fail to become active if the spanning tree protocol detects a loop in the network. Note that if either source route or transparent bridging fails to become active on any LAN Emulation Client (LEC) where requested, then the LED will be yellow

**Reading GroupSwitch port LEDs**

Each GroupSwitch port has two LEDs on either side of the port, to indicate the status of the port, see Table 11.7.

*Table 11.7 LED states for GroupSwitch ports*

LED state	Description
both LEDs off	The port is not currently in use
left LED steady green	The port is inserted
left LED flashing green	The port has been disabled by the management program
right LED flashing red	An error has been detected, by fault finding and the port has been disabled by the management program

**Reading LEDs on the Smart Ringswitch TLS Module**

Each Smart Ringswitch TLS Module has two LEDs that indicate the status of the Smart Ringswitch TLS Module. The lower LED displays configuration information as shown in Table 11.8.

*Table 11.8 Lower LED states for Smart Ringswitch TLS Module*

LED state	Description
off	No leg ports configured
yellow	One leg port is enabled
	The LED will flash if the leg port connections into the bridge are not in the forwarding mode
green	Two or more leg ports are enabled
	The LED will flash if the leg port connections into the bridge are not in the forwarding mode
red	Fatal fault detected

When the lower LED is yellow or green, the upper LED provides an indication of the traffic activity during the preceding 1/10th of a second as shown in Table 11.9.

Table 11.9     *Upper LED states for Smart Ringswitch TLS Module*

LED state	Description
off	No activity
green	<= 50,000 pps throughput
yellow	> 50,000 and <= 100,000 pps throughput
red	100,000 pps throughput

**Reading LEDs for Fast Failover on HSTR modules**

The LEDs on the active port indicate the status, mode, and ring speed of the port as described in “Reading token-ring port LEDs” above). The standby port uses the LED combinations displayed in Table 11.10.

Link Up means that the Fast Failover link is operational. Link Down means that the Fast Failover link is not operational.

*Table 11.10 LED states for the standby port in a Fast Failover link*

LED state		Description		Link Status
Top LED	Bottom LED	Port mode	Port status as displayed on LCD	
flashing green	flashing green	Node	DTR Norm	Link Up
flashing yellow	flashing yellow	Concentrator	DTR Norm	Link Up
unlit	yellow	Concentrator	Ready	Link Down
unlit	flashing red	Node	OpenFail	Link Down
flashing red	flashing red	Concentrator	OpenFail	Link Up
flashing red	flashing red	Node	OpenFail	Link Up

**Reading Ethernet port LEDs**

Each Ethernet port has two LEDs that indicate the status and mode. The lower LED displays the information in Table 11.11. The upper LEDs states are the same as those for the token-ring and FDDI ports as described in Table 11.3.

*Table 11.11   Lower LED states for Ethernet ports*

LED state	Description
yellow	The Ethernet port is enabled but the link is down
green	The Ethernet port is enabled and a link has been established
off	The Ethernet port is disabled

## Reading the LCD

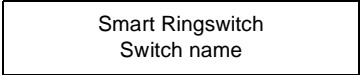
View information about the status of the Ringswitch from the LCD display on its front panel.

### Reading status messages on the LCD panel

The Ringswitch has an LCD panel that shows status messages and alert messages that indicate changes in the status of the Ringswitch and each of the ports. For information about port status, see “Module status messages on the LCD panel” later in this chapter.


Press the paddle switch downwards to display information about each of the installed Ringswitch modules. The LCD displays information about the modules in the order they are inserted into the Ringswitch chassis. Click the paddle switch upwards to display more detailed individual port information about the currently selected module.

The default LCD screen displays the name of the Ringswitch which represents the switch module:



Smart Ringswitch  
Switch name

Press the paddle down to display information about the first Ringswitch slot. The LCD screen displays the number of the slot, the type of module installed, and the hardware version number.



Slot 1 TRP4  
Rev 01

Continue pressing the down paddle to display information about each of the Ringswitch modules. Once information about all of the slots has been displayed, the LCD screen will display the Ringswitch name again.

Reading Ringswitch Switch Module status messages

Switch Module status messages provide general information about the Ringswitch. To display this information, press the down paddle until the LCD screen displays the name of the Ringswitch. Then press the paddle up to provide more detailed information about the Ringswitch. Continue pressing the paddle up to scroll through associated information. The LCD displays the status messages shown in Table 11.12.

Table 11.12 Ringswitch Switch Module status messages on the LCD panel

Message	Description
Smart Ringswitch Switch name	The name of the Ringswitch
23-07-96 11.34 3.00 Hardware: Switch 113b (10)	The name and revision numbers of the hardware and software
Bridge:1 Mode:SRT (4.5K)    Bridge:1 Mode:SRT (18K) Address: 0000f65E0C40      Address: 0000f65E0C40	The bridge number, forwarding mode, and base address that identify the device. The addresses of ports increment from the base address. The forwarding modes are Disa, SR, TB, SRT, SRT+. The bridge’s maximum frame size modes are 4.5K and 18K
IP addr: 194.32.22.119 Subnet : 255.255.255.0	The IP address and subnet mask that identify the device

*Table 11.12   Ringswitch Switch Module status messages on the LCD panel*

Message	Description
<div> <div>Download status:</div> <div>           Searching            Loading            Success            Failure         </div> </div> <div>           No downloads attempted   XXXX code y% complete         </div>	<p>The Download status message can be one of four possibilities. Searching means the Ringswitch is searching for files. Loading means it is loading code. Success means it has finished loading code. Failure means there was a problem with the last download (see the TrueView status message for more information). The second line of this message either indicates that the Ringswitch has not attempted a download since it was last rebooted or that the Ringswitch is loading code where XXXX is replaced by Micro, Boot, ATM, or New. New means that the download has just started and has not been recognized yet. Note that if you are using Multi-Download, XXXX is replaced by the release number</p>
Frames Rx: 10,260 Frames Tx: 10,260	The number of frames that the Ringswitch has received and transmitted
Frames/ Sec: 5 Bytes / Sec: 101	The number of frames per second, and bytes per second, that the Ringswitch is forwarding

LCD status messages for token-ring ports

Token-ring port messages provide detailed information about each of the ports within a token-ring or GroupSwitch module. To display this information, press the paddle down until the LCD screen displays the name of the required slot. Then press the paddle up to provide detailed information about each of the ports in the selected slot. The LCD displays the status messages shown in Table 11.13.

Table 11.13 Token-ring port status messages on the LCD panel

Message	Description	
Slot <n> XXX Rev 0?	XXX	The location of the card, what the card is, and the hardware revision number
1:2 SR=402/Fwds TB=Disa (02) Conc 16, Normal	1:2	The slot and port number of the token-ring port
	SR=402/Fwds	The forwarding mode, number of the ring attached to the port, and the source routing status (see Table 11.14)
	TB=Disa	The transparent status of the port (see Table 11.15)
	(02) Conc 16	The ‘total’ port number, the interface mode (see Table 11.16), and the speed of the port
	Normal	The status of the port (see Table 11.17)

---

The LCD displays the source routing status messages shown in Table 11.14.

*Table 11.14   Source routing status messages on the LCD panel*

Message	Description
Disa	Source routing is disabled
Down	Source routing is enabled, but the port interface is disabled
Test	The bridge test is running on the port
Fwd	The port forwards source-routed frames, but does not forward Spanning-Tree Explorer (STE) frames
Fwds	The port forwards source-routed frames and STE frames
Fail	The bridge test for the port has failed. Two token-ring ports are connected to the same ring, or a device with the same bridge number as the Ringswitch exists between two rings that are attached to token-ring ports, or two ports are configured with the same ring number but cannot correctly form a Source Routing Transparent Plus (SRT+) Ring. This could be because one or more ports is not enabled for SRT operation, or because the Ringswitch is not globally enabled for SRT+ operation

The LCD displays the transparent status messages shown in Table 9.11.

*Table 11.15 Transparent status messages on the LCD panel*

Message	Description
Disa	Transparent bridging is disabled
Lis	The port is listening to prepare to forward frames using transparent bridging. It is not yet learning addresses because the spanning tree topology may be undergoing change
Lea	The port is learning addresses, to prepare to forward frames using transparent bridging
Fwd	The port is forwarding frames using transparent bridging
Down	Transparent bridging is enabled, but the port interface is disabled
Blk	The port is blocking because the spanning tree protocol detected a parallel path

---

The LCD displays the token-ring port interface modes shown in Table 11.16.

*Table 11.16 Token-ring port interface modes on the LCD panel*

Message	Description
Node	The port is operating in automatic node mode
Conc	The port is operating in automatic concentrator mode
ClisN	The port is operating in classic half-duplex node mode
ClisC	The port is operating in classic half-duplex concentrator mode. GroupSwitch - The port is operating in five-port hub mode
DtrN	The port is operating in full-duplex node mode
DtrC	The port is operating in full-duplex concentrator mode
Cau	The fiber token-ring port is operating in CAU RI/RO mode

The LCD displays the token-ring port status messages shown in Table 11.17.

*Table 11.17 Token-ring port status messages on the LCD panel*

Message	Description
Closed	The port is closed
Opening	The port is opening
Open	The port is open
OpenFail	The last open request failed
Normal	The port is operating normally in classic half-duplex mode
Ready	The port is in concentrator mode and waiting for a node to insert
DTR Norm	The port is operating normally as a Dedicated Token Ring (DTR) port
Closing	The port is closing
Removed	The port has closed because of a ring error, or was removed from the ring by a 'remove' MAC frame because a management station detected a fault on the ring
?Wire	The port is configured in node interface mode, and a problem exists with the port or the device attached to the port. If the port is configured in concentrator interface mode, this message does not appear

*Table 11.17    Token-ring port status messages on the LCD panel*

Message	Description
?Signal	The port is not receiving a valid token-ring signal from the ring. Check that the cable is not disconnected or broken
?Beacon	The port is configured in node interface mode, and the ring to which the port is attached is beaconing. If the token-ring port is configured in concentrator interface mode, there is a problem with the port or with the attached device
?HardErr	A hard error condition exists on the ring to which the port is connected
?Single	The port is the only node on the ring. This message does not represent an error condition unless you expect more nodes to appear on the ring

**LCD status messages for the FDDI Module**

The LCD panel displays the following information messages when you install a FDDI Module.

*Table 11.18   FDDI port status messages on the LCD panel*

Message	Description	
Slot <n>FDDI Rev 0?	FDDI	The location of the card within the Ringswitch, the type of card and the hardware revision number
3:1 SR=409/Fwds TB=Disa (09) Fix=Y, Normal	3:1	The slot and port number of the FDDI port
	SR=409/Fwds	The forwarding mode, number of the ring attached to the port, and the source routing status (see Table 11.14)
	TB=Disa	The transparent status of the port (see Table 11.15)
	(09) Fix=Y	The ‘total’ port number, and whether protocol fixups have been enabled (see IP and IPX protocol fixup capabilities in Chapter 8, Configuring the Smart Ringswitch FDDI Module)
	Normal	The status of the port (see Table 11.19)

The LCD panel displays additional messages when you install an FDDI Module. The FDDI port status messages shown in Table 11.19.

*Table 11.19   FDDI port status messages on the LCD panel*

Message	Description
Closed	The port is closed
Opening	The port is opening
Open	The port is open
OpenFail	The last open request failed
Closing	The port is closing
?RingInop	The Ringswitch cannot enable the FDDI interface. Either no cable is connected to the port, or the connection to the ring has been refused. Check your network connections and port types
?Twisted	The Ringswitch cannot enable the FDDI interface. The cables are connected incorrectly. For example, port type A of a dual attach station is connected to port type A on the FDDI module
?ThisDup	The Ringswitch cannot enable the FDDI interface. The connection has failed the duplicate address test because there are two ports on the network with the same Locally Administered Address (LAA). Check the address that is configured for the FDDI interface, and the addresses of nodes on the ring

*Table 11.19 FDDI port status messages on the LCD panel*

Message	Description
?OtherDup	There are two ports on the network with the same LAA. Check the address that is configured for the FDDI interface, and the addresses of nodes on the ring
?StkBypass	The Ringswitch cannot enable the FDDI interface. The optical bypass is stuck and the Ringswitch is not on the ring

**LCD status messages for the ATM Module**

The LCD panel displays additional status messages when you install an ATM Module. ATM interface status messages are described in Table 11.20. The possible values of each item are up, down, or disa (disabled).

*Table 11.20 ATM interface status messages on the LCD panel*

Message	Description	
Slot <n>ATM Rev xx.xx.xx	ATM	The location of the card within the Ringswitch, the type of card and the hardware revision number
3:1 SONET=Down ATM=Down ILMI=Down SIG/Auto=Dow	SONET=	Describes the status of the SONET (Synchronous Optical NETwork) ATM physical link layer
	SDH=	Describes the status of the SDH (Synchronous Digital Hierarchy) ATM physical link layer
	ATM=	Describes the status of the ATM interface
	ILMI=	Describes the status of the Interim Local Management Interface (ILMI)
	SIG/Auto=	Describes the status of the automatically selected signalling version
	SIG/3.0=	Describes the status of the ATM User-to-Network Interface (UNI) signalling version 3.0
	SIG/3.1=	Describes the status of the ATM User-to-Network Interface (UNI) signalling version 3.1

The LCD also displays information about each of the LECs currently supported by the module. These are described in Table 11.21.

Table 11.21    ATM LEC status messages on the LCD panel

Message	Description	
Slot <n>ATM Rev xx.xx.xx	ATM	The location of the card within the Ringswitch, the type of card and the hardware revision number
3:1 SR=409/Fwds TB=Disa (09)xxx Jackson	3:1	The slot and LEC number of the ATM port
	SR=409/Fwds	The forwarding mode, number of the ring attached to the port, and the source routing status (see Table 11.14)
	TB=Disa	The transparent status of the port (see Table 11.15)
	(09)	The ‘total’ port number
	LEC status	The status can be either: Fault, Closed, or Opening. If the display reads Opening, it will show what sort of network it opens on to, that is, either Token Ring (TRN) or Ethernet (ETH)
	Jackson	The name of the ELAN

**LCD status messages for the GroupSwitch Module**

The LCD panel displays the following information messages when you install a GroupSwitch Module.

*Table 11.22 LCD status messages for the GroupSwitch*

Message	Description
Slot <n>GroupSwitch Rev 0?	The location of the GroupSwitch within the Ringswitch and the hardware revision number
3:1 SR=992/Disa TB=Fwd (09) DTRc, Normal	3:1 The slot and port number in the GroupSwitch
	SR=992/Disa The forwarding mode, the number of the ring attached to the port, and the source routing status
	TB=Fwd The transparent status of the port
	(09) DTRc The 'total' port number, and the mode and ring speed of the port
	Normal. The status of the port (see Table 11.17)

**LCD status messages for the Smart Ringswitch TLS Module**

The LCD panel displays additional status messages when you install a Smart Ringswitch TLS Module. Status messages for the Smart Ringswitch TLS Module are described in Table 11.23.

*Table 11.23    Smart Ringswitch TLS Module status messages on the LCD panel*

Message	Description
Slot <n> TLS Rev xx.xx.xx	The location of the Smart Ringswitch TLS Module and the firmware revision level
Slot <n> TLS Unsupported in slots 1-3	The location of a disabled Smart Ringswitch TLS Module within the Ringswitch. The Smart Ringswitch TLS Module is not supported in Slots 1-3 of the Smart Ringswitch Plus Chassis
Slot <n> TLS 2nd TLS card unsupported	The location of a disabled Smart Ringswitch TLS Module within the Ringswitch. The Ringswitch does not support multiple Smart Ringswitch TLS Modules
TLS Forward Rate =xxxxxx CPU=xx.xx FreeMem=xxxxk	The current IP forwarding rate, the CPU utilization and the free memory

*Table 11.23 Smart Ringswitch TLS Module status messages on the LCD panel*

Message	Description	
x:xx SR=409/Fwds TB=Disa (49) xxxx      xx.xx.xx.xx	x.xx	The slot and leg number
	SR=409/Fwds	The source route forwarding mode, number of the ring attached to the port, and the status (see Table 11.14)
	TB=Disa	The transparent status of the port (see Table 11.15)
	(49)	The ‘total’ port number
	xxxx	The status which can be Fault, Opening, Down, Up
	xx.xx.xx.xx	If status is Up, this is the IP number of the leg port
x.xx LEG port inactive	x.xx	The slot and leg number of an inactive port

LCD status messages for Fast Failover on HSTR modules

The LCD panel displays additional status messages when you configure a Fast Failover link on an HSTR module. There are two LCD screens which display Fast Failover information. The first screen displays bridging information; the second displays information for the standby port. Status messages regarding bridging information for the Fast Failover link are described in Table 11.24. Status messages regarding information for the standby port in the Fast Failover link are described in Table 11.25.

Table 11.24 Bridging information for the Fast Failover link

Message	Description	
S:P SR=nnn/FwdS TB=Fwd (nn) Active, P_status FFO	S	Slot number
	P	Port number
	SR=nnn/Fwds	The source route forwarding mode, number of the ring attached to the port, and the status (see Table 11.14)
	TB=Fwd	The transparent status of the port (see Table 11.15)
	(nn)	The ‘total’ port number
	Active	Indicates that this LCD display is giving you information about the active link
	P_status	Port status. See Table 11.17 for port statuses
	FFO	Indicates the Fast Failover link

*Table 11.25 Standby port information for the Fast Failover link*

Message	Description	
S:P(Active)/Q L_status StandbyPort status FFO	S	Slot number
	P & Q	Port numbers in the Fast Failover link
	(Active)	Indicates the active port. The word Active appearing after the number of the active port. In the following example Port 2 is the active port: 6:1/2(Active) Whereas in the following example Port 1 is the active port: 6:1(Active)/2
	L_status	Fast Failover link status which is either Link Up or Link Down. Link Up means that the Fast Failover link is operational. Link Down means that the Fast Failover link is not operational
	StandbyPort status	Status of the standby port which will be one of the following: OpenFail, Opening, Open, Closed DTR Norm, or Ready
	FFO	Indicates the Fast Failover link

LCD status messages for Ethernet ports

The LCD panel displays additional status messages for the Smart Ringswitch 2-Port Ethernet Module. Status messages for the Ethernet port provide detailed information about the status and operation of the port. To display this information, press the paddle down until the LCD screen displays the name of the required slot. Then press the paddle up to provide detailed information about each of the ports in the selected slot. The Ethernet port status messages that the LCD panel displays are described in Table 11.26. The transparent and source route forwarding tables for Ethernet are the same as those for token ring. For more information, see Table 11.14 and Table 11.15.

Table 11.26 Ethernet port status messages on the LCD panel

Message	Description	
Slot <n> XXX Rev 0?	XXX	The location of the card, what the card is, and the hardware revision number
1:2 SR=402/Fwds TB=Disa (02) Open,100 Lk:Up FD	1:2	The slot and port number of the Ethernet port
	SR=402/Fwds	The forwarding mode, number of the ring attached to the port, and the source routing status (see Table 11.14)
	TB=Disa	The transparent status of the port (see Table 11.15)
	(02) Open, 100	The ‘total’ port number, the interface mode (see Table 11.27), and the speed of the port
	Lk:up FD	The ports link status and the ports duplex mode (see Table 11.27)

*Table 11.27 Ethernet port interface modes*

Message	Description
Closed	The port is closed
Open	The port is open
Fault	The port has detected a fault while trying to open/close
Lk:Up	The link is up. That is, the port has detected another Ethernet interface when it is in an open state
Lk:Down	The link is down. The port has failed to detect another Ethernet interface while open
10	The port is open at 10Mbps if Lk=Up, else it will try and establish a link at 10Mbps if Lk=Down
100	The port is open at 100Mbps if Lk=Up, else it will try and establish a link at 100Mbps if Lk=Down
AS	The port will auto-negotiate w.r.t speed when trying to establish a link
HD	The port is open and in half duplex mode if Lk=Up, else it will try and establish a half duplex link if Lk=Down
FD	The port is open and in full duplex mode if Lk=Up, else it will try and establish a full duplex link if Lk=Down
AD	The port will auto-negotiate w.r.t duplex mode when trying to establish a link

**Module status messages on the LCD panel**

When the Ringswitch re-boots, the LCD displays information about each of the modules in the chassis. Press the paddle switch *downwards* to display information about each of the installed modules. Information about each of the modules is displayed in the order they are inserted into the chassis, reading from top to bottom. If no specific message is given, contact your customer service representative quoting the error number displayed.

The following table includes the messages displayed if the microcode in the selected slot needs updating:

*Table 11.28    Module status messages on the LCD panel*

Message	Description
Token-ring messages	
Slot <n> TRP4 Rev xx.xx.xx	Correctly functioning token-ring Module
Slot <n> GroupSwitch Rev xx.xx.xx	Correctly functioning GroupSwitch Module
Slot <n> HSTR4 Rev xx.xx.xx	Correctly functioning Smart Ringswitch 4-Port HSTR Copper Module
Slot <n> HSTR4 Rev xx.xx.xx (no open)	The Smart Ringswitch 4-Port HSTR Copper Module is not correctly functioning for either of the following reasons: <ul style="list-style-type: none"><li>• it is in one of the top three slots of the Smart Ringswitch Plus</li><li>• there is invalid Firmware on the module</li></ul>

*Table 11.28 Module status messages on the LCD panel*

Message	Description
FDDI messages	
Slot <n> FDDI Rev xx.xx.xx	Correctly functioning FDDI Module
Slot <n> FDDI Rev Unknown (Disabled)	The FDDI Module is running microcode older than v2.08. The module must be moved to any of the top three slots before it can be upgraded
Slot <n> FDDI Rev xx.xx.xx (No Open)	The FDDI Module is running microcode older than v2.08. The module must be upgraded before the FDDI interface is enabled. The upgrade must occur via a port other than FDDI Module's port
Slot <n> FDDI Rev xx.xx.xx (No Fwd)	The FDDI Module is running microcode older than v2.10. The module must be upgraded before the FDDI interface is enabled for bridging. This upgrade can occur via the module's own port
ATM messages	
Slot <n> MMF ATM Rev xx.xx.xx	Correctly functioning ATM Module
Slot <n> MMF ATM Rev xx.xx.xx (No Fwd)	The ATM Module is running microcode older than v2.00. The module must be upgraded before the ATM interface is enabled for bridging. This upgrade can occur via the module's own port

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**Alert messages on the LCD panel**

Alerts are informative messages that appear on the LCD panel of a Ringswitch for two seconds. They temporarily override the normal display. Alerts indicate events such as a port failing to open. When you use the paddle switch to view the Ringswitch LCD screens, the alerts are disabled for ten seconds to allow you to read the LCD screens without the display being interrupted by an alert. For information about alert messages, see Appendix I, Troubleshooting.



# Using the Ringswitch Reset button

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This chapter explains how to use the Reset button, and download boot code or run-time microcode to the Ringswitch.

The Reset button on the Ringswitch provides a range of functions. The function you select is determined by the stage at which you release the Reset button. The sections in this chapter explain when to release the button to perform each function. You can use the Reset button to re-boot the device, erase the management password, load new microcode, erase the stored configuration information, or re-boot using the boot code stored in Read-Only Memory (ROM).

You can also perform all the functions by using TrueView Ringswitch Manager. For information about the Ringswitch Management software, refer to the booklet accompanying the Smart Ringswitch CD.

## Re-booting the switch

You can force the Ringswitch to re-boot and run its start-up self-test program.

To reset the Ringswitch:

- 1 Press and hold the Reset button.

The LCD display shows the following message:

Release reset now to  
start normal boot

- 2 Release the Reset button.  
The Ringswitch re-boots.

## Erasing the management password

You can reset the Ringswitch password, which is implemented in the SNMP community string, to the default password PUBLIC. This will remove the security of a management password.

To erase the management password:

- 1 Press and hold the Reset button.

The LCD display shows the following message:

Release reset now to  
start normal boot

- 2 Continue to hold down the Reset button.

The LCD display shows the following message:

Release reset now to  
erase mgmt password

- 3 Release the Reset button.

The management password resets to PUBLIC.

## Downloading new microcode

You can run the loader program, which waits for code to be downloaded and then erases the old microcode.



**Caution:** When you update to the latest version of microcode, you must also upgrade to the most recent version of the TrueView Ringswitch Manager. Make sure the code you download supports the same set of features as the existing code. Otherwise, the operation may make the Ringswitch or certain ports inoperable.

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Before downloading new code, check the version that is running on the device by reading the LCD panel, or by using TrueView Ringswitch Manager.

To download code to the Ringswitch:

- 1 Press and hold the Reset button.

The LCD display shows the following message:

Release reset now to  
start normal boot

- 2 Continue to hold down the Reset button.

The LCD display shows the following message:

Release reset now to  
erase mgmt password

- 3 Continue to hold down the Reset button.

The LCD display shows the following message:

Release reset now to  
load new microcode

- 4 Release the Reset button.

The Ringswitch waits for new microcode to be downloaded.

## Erasing the stored configuration

You can restore the configuration of the Ringswitch, including the management password, to the factory default settings. For more information on factory default settings, "Preparing to use TrueView Ringswitch Device Manager".



**Caution:** If the Ringswitch is operating on the network this may cause some connections, including the management connection, to be lost.

---

To erase the configuration of the Ringswitch:

- 1 Press and hold the Reset button.  
The LCD display shows the following message:  
Release reset now to  
start normal boot
- 2 Continue to hold down the Reset button.  
The LCD display shows the following message:  
Release reset now to  
erase mgmt password
- 3 Continue to hold down the Reset button.  
The LCD display shows the following message:  
Release reset now to  
load new microcode
- 4 Continue to hold down the Reset button.  
The LCD display shows the following message:  
Release reset now to  
erase stored config
- 5 Release the Reset button.  
The stored configuration is erased.

## Forcing the switch to boot from ROM

You can force the Ringswitch to restart using the boot code stored in Read-Only Memory (ROM). If the current boot code is the same as the code stored in ROM, this does not affect the operation of the Ringswitch, so the step does not appear in the reset sequence.



**Caution:** The boot code stored in ROM may not support the same set of features as boot code that has been subsequently downloaded to the Ringswitch.

Before booting from the code stored in ROM, check the version that is running on the device by reading the LCD panel, or by using TrueView Ringswitch Manager.

To force the Ringswitch to re-boot using the boot code in ROM:

- 1 Press and hold the Reset button.  
The LCD display shows the following message:  
  
Release reset now to  
start normal boot
- 2 Continue to hold down the Reset button.  
The LCD display shows the following message:  
  
Release reset now to  
erase mgmt password
- 3 Continue to hold down the Reset button.  
The LCD display shows the following message:  
  
Release reset now to  
load new microcode

- 4    Continue to hold down the Reset button.  
The LCD display shows the following message:  
  
Release reset now to  
erase stored config
- 5    Continue to hold down the Reset button.  
The LCD display shows the following message:  
  
Release reset now to force  
boot from ROM
- 6    Release the Reset button.  
The Ringswitch re-boots using the boot code stored in ROM.

# Network design issues

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This appendix describes the network design issues concerning how the Ringswitch implements token-ring switching, and describes the frame forwarding techniques that the Ringswitch uses.

The Ringswitch offers four bridging techniques:

- Source-Route Bridging
- Transparent Bridging
- Source-Route Transparent Bridging
- Source-Route Transparent Plus Bridging

This choice of bridging techniques enables you to select the mode that best matches your network environment.

With a Switch-3 Module and a Smart Ringswitch 2-Port Ethernet Module installed, you can also use the Ringswitch to connect token-ring LAN segments to Ethernet LAN segments. The Ethernet Module performs translational bridging between the token-ring and Ethernet segments.

With a Smart Ringswitch TLS Module and a Switch-3 Module installed, the Ringswitch can also route IP traffic.

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To support Transparent Bridging, Source-Route Transparent Bridging, or Source-Route Transparent Plus Bridging, the Ringswitch must have a Switch-2 or Switch-3 Module installed. To support routing between these bridging environments the Ringswitch must have a Switch-3 Module and a Smart Ringswitch TLS Module installed. For information about finding out the type of Switch Module hardware you have in your Ringswitch, see “Identifying the type of Switch Module hardware” in Chapter 1, Introduction to the Smart Ringswitch Family.



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**Note:** If you mix Source-Route Bridging and Transparent Bridging in the same network, configure all Ringswitches and their modules to support SRT or SRT+ bridging.

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## About token-ring switching

This section describes the benefits of token-ring switching, and how the Ringswitch performs cut-through switching to forward frames without incurring excessive latency or making the network difficult to administer. This section also describes some broadcast control features that will improve network performance.

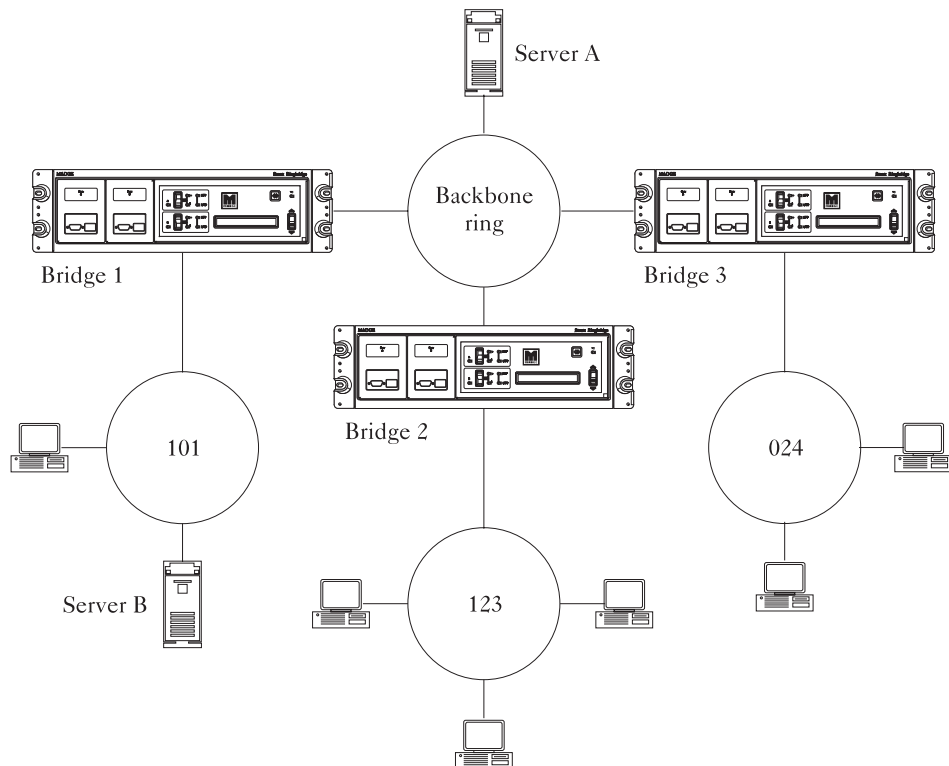
### Bridges and routers

Large token-ring Local-Area Networks (LANs) are divided into smaller rings, usually by the use of bridges and routers, because the number of stations that can be connected to any single ring is limited. Furthermore, since stations must contend for the token with other stations on the same ring, attaching fewer stations to a ring gives each one a greater number of opportunities to transmit and receive information.

The traditional method of connecting multiple token-ring networks is by using a source-routing bridge. For example, bridges are often used to link workgroup rings to the backbone ring. However, the introduction of the bridge can significantly reduce performance at the user's workstation.

In Figure A.1, Bridges 2 and 3 that connect local rings to the backbone ring reduce the performance of Rings 123 and 024 that access Server A. Further problems may be introduced by aggregate traffic loading on the backbone ring.

*Figure A.1 Bridges connecting local rings to a backbone ring*



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As a network grows in size, routing protocols are often employed to sub-divide the network into more manageable segments. An example of this is the use of IP subnets. Communication between these subnets requires a router. The router's function is to inter-connect the network's subnets, and restrict the intra-subnet traffic to the correct subnets. The Ringswitch provides routing functionality with the Smart Ringswitch TLS Module.

## **The Ringswitch**

The Ringswitch is a cut-through token-ring switch with multiple token-ring ports that support the attachment of wiring concentrators and lobe stations. The Ringswitch provides a high-capacity interconnection between multiple token-ring segments, forwarding frames without incurring excessive latency or making the network difficult to administer.

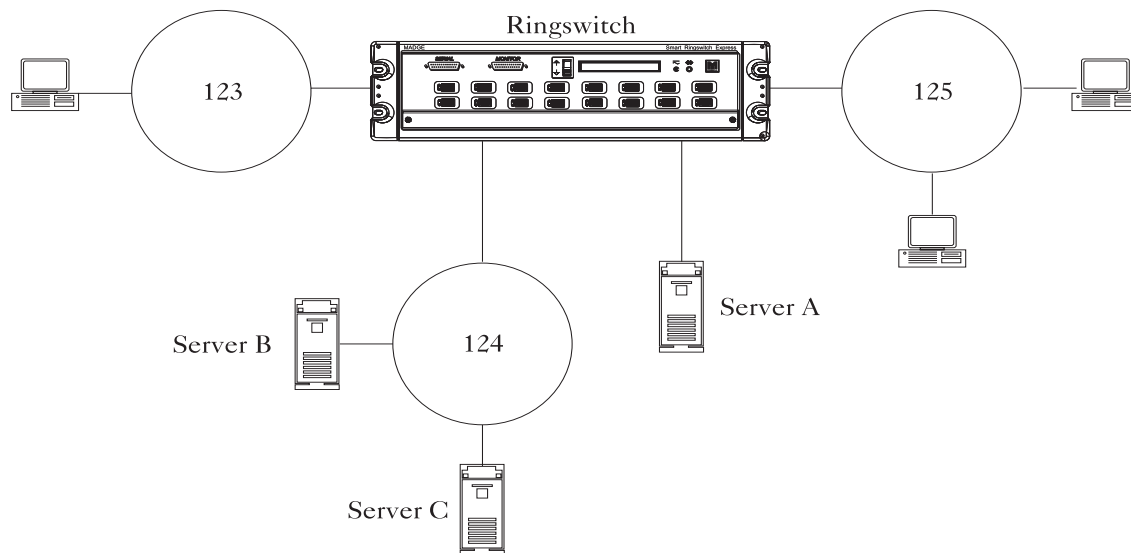
You can use the Ringswitch in conjunction with an Ethernet Module to link Ethernet and token-ring LAN segments together.

As a local collapsed backbone device, the Ringswitch offers a lower per-port cost and incurs lower interstation latency than a bridge, and supports the direct connection of workstations and network servers. Alternatively, you can use the Ringswitch in conjunction with a Smart Ringswitch TLS Module, providing a high-capacity interconnection between token-ring segments while retaining the network segmentation provided by the router.

In Figure A.2, servers are located either on a single ring or are directly connected to the Ringswitch. Because the Ringswitch has a greater internal capacity than 16 Mbps token ring, it can enable workgroups 123 and 125 to access the servers without becoming overloaded by traffic.

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*Figure A.2 Ringswitch as ‘collapsed backbone’*



---

In addition, the Ringswitch introduces minimal latency. This means that nodes can communicate with servers on another ring and deliver performance as if both were attached to the same ring. This occurs because the Ringswitch determines the destination of non-broadcast frames before the whole packet is received, then immediately establishes a connection between the input port and the output port, and starts to transmit the packet onto the destination ring. This technique is known as cut-through switching.

### **Cut-through switching**

The Ringswitch transfers non-broadcast packets between rings without buffering the entire frame into memory. Instead, the Ringswitch analyses the packet header and determines the destination of a packet when it has received the first few bytes of a frame. When the Ringswitch has determined the destination, it establishes a connection between the input and output ports and, when the token becomes available, the Ringswitch transmits the packet onto the destination ring.

In accordance with specification ISO/IEC 10038, the Ringswitch uses Access Priority 4 to gain priority access to the token on the output ring. This increases the proportion of packets that can be cut-through, and makes it possible for the Ringswitch to reduce latency. However, in certain circumstances, the cut-through technique cannot be applied and the Ringswitch must buffer packets into memory.

Buffering must be performed when:

- the Ringswitch has two packets to transmit onto the same ring - one packet is buffered, while the other is sent
- a packet is switched between rings at different speeds
- the destination ring is beaconing

---

## Source-Route Bridging

Source-Route Bridging (SRB) is a method for token-ring bridging that involves using endstations for path control. Source-routing bridges are traditionally used to connect token-ring LANs. Source-routing bridges do not make use of lookup tables, but use a non-address-based system of establishing a route between participating nodes.

Clients first establish a route to a server using a route discovery process and then insert a description of the selected route into the Routing Information Field (RIF) of each token-ring frame sent. Network devices such as bridges and switches then use this information to make forwarding decisions for each frame received.

The route discovery process uses one of two broadcast techniques:

- All Routes Explorer (ARE)

Frames are sent out that traverse every possible route to the destination. This identifies the fastest route but generates a large amount of network traffic.

The Ringswitch buffers an ARE frame into memory, then copies it to the token-ring ports. The token-ring ports update the frame in memory with the bridge number of the Ringswitch and number of the attached ring to reflect that the frame has been copied to the attached ring.

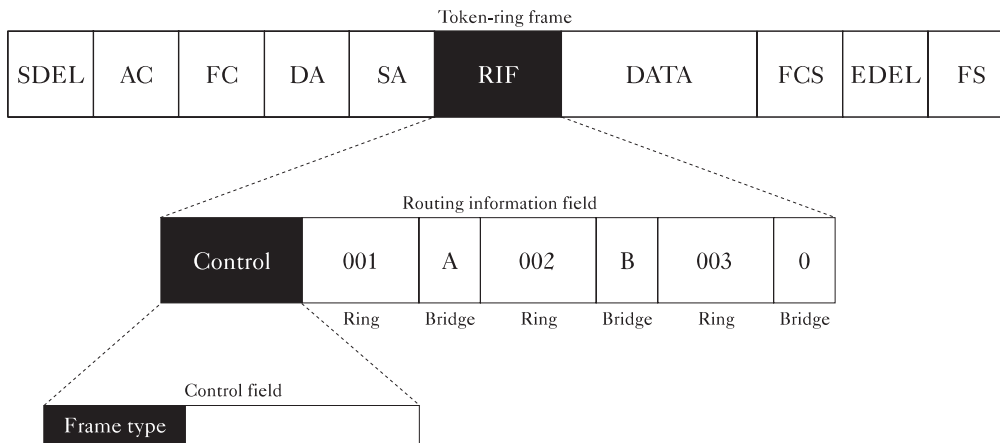
- Spanning Tree Explorer (STE Also known as Single Route Explorer or SRE)

The Spanning Tree algorithm ensures that there is only one path used between source and destination rings. Even if multiple paths exist, only one will be used. This reduces the amount of traffic generated, but it may not always select the fastest path and it does not allow for any degree of load sharing where parallel paths exist.

When clients have established a route, they include the information that defines the route in each packet that they send. The Ringswitch uses the source-routing information that defines the ring to which the packet is to be passed, to forward packets with minimal processing.

Figure A.3 shows how source-routing broadcast packets contain information that identifies the ring on which the packet originates. Therefore, switching by source routing also facilitates port blocking and broadcast filtering, which allows you to implement broadcast control strategies and configure virtual LANs that span multiple Ringswitch devices.

*Figure A.3 Routing Information Field (RIF) in source-routed frame*

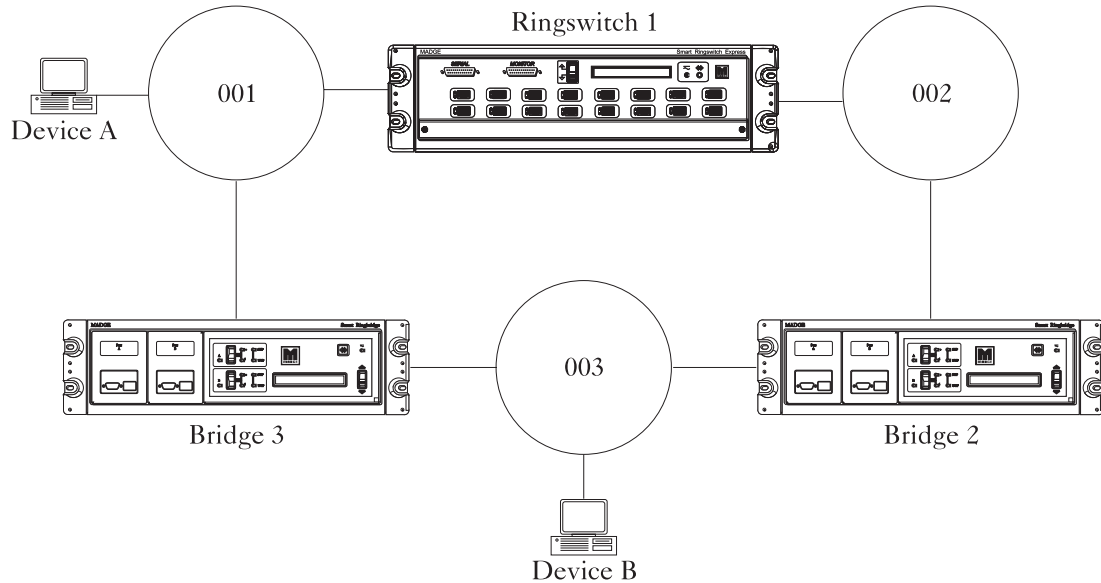


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An example of simple source-routing (see Figure A.4) follows:

- 1 Device A needs to establish a session with Device B, which is connected to a different ring.
- 2 Device A sends out an ARE frame to discover all possible routes to Device B.
- 3 The ARE frame is copied every time it comes across a bridge, with one copy crossing the bridge and collecting routing information, and the other copy continuing to circulate the ring. In the example, the ARE frame crosses Ringswitch 1, collecting routing information consisting of ring numbers and the bridge number (001, 1, 002).
- 4 The ARE frame continues around Ring 002 and crosses Bridge 2, increasing the routing information (001, 1, 002, 2, 003).
- 5 The ARE frame finds Device B and is returned to Device A using the same route.
- 6 Because the frame was copied when it crossed Bridge 1, the other copy of the frame continued around Ring 1 and crossed Bridge 3, increasing the routing information (001, 3, 003).
- 7 This frame finds Device B and is returned to Device A using the same route.
- 8 The ARE frame found two possible routes between Devices A and B. In this example, the route that is used is the first that returns to A, and this may not necessarily be the shortest route. However, end systems can select the first, last, or shortest route.
- 9 The routing information is put into the RIF in the 802.5 frame, and that route is used for the duration of the session.

Figure A.4 Source-Route Bridging



Use Source-Route Bridging where all end stations, servers, switches, and bridges support Source-Route Bridging. All Ringswitch ports must have a unique ring number so that frames can be forwarded to the appropriate port.

---

## Transparent Bridging

Transparent Bridging (TB) operates at the datalink layer and filters or passes traffic based on the destination address of the frame. A transparent bridge makes decisions concerned with passing frames through the network, whereas a source-routing bridge forwards frames according to routing information in the frame. Transparent bridges are sometimes referred to as promiscuous bridges, because they read every frame to determine whether the frame should be forwarded to the remote network.

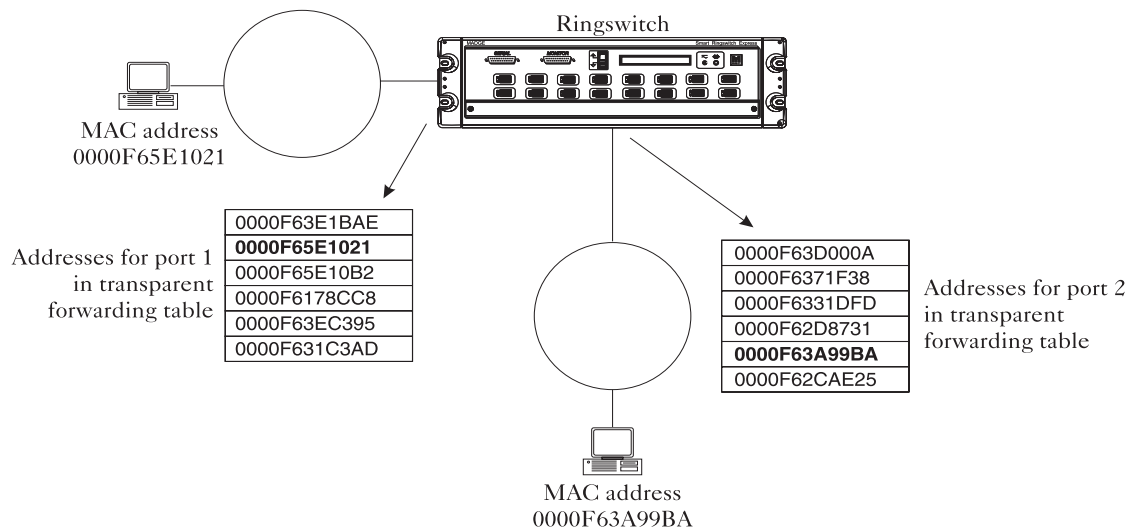
When the forwarding mode is set to transparent, the Ringswitch adaptively creates its own tables of network addresses by analyzing the traffic it processes. The Ringswitch ‘learns’ about the network by recording the source address of each frame according to the port that the frame is received on. It stores the information in a forwarding table that contains the addresses of all the devices on the local network for each port.

### **Transparent forwarding table**

To provide the capacity needed for backbone applications in large networks, the Ringswitch uses forwarding tables that support very large numbers of MAC addresses. When the forwarding table is full, the Ringswitch starts to overwrite the entries at the beginning of the table with each new source address that it has not previously encountered. Eventually, the forwarding table contains the addresses that make most frequent use of the LANs that the Ringswitch connects.

The Ringswitch performs learning automatically when it starts up. It does not reach optimum forwarding performance until it has read most of the possible frame addresses that appear on the network.

Figure A.5 Transparent Bridging



When the Ringswitch has learned about the network, it monitors the destination address of each frame and compares it with the entries in the forwarding database. If the Ringswitch finds a match in the table of remote addresses, it passes the frame to the corresponding destination port.

If the location of the destination MAC address is not known, the Ringswitch forwards the frame to every port. To ensure that frames sent to an unknown address do not get continuously propagated, the Spanning Tree algorithm is used to ensure that only one path to the destination exists.

In this mode, ring numbers are not involved in the forwarding process so the Ringswitch imposes no constraints on how they are assigned. Use Transparent Bridging where all endstations, servers, switches, and bridges support Transparent Bridging.

---

### **Transparent filtering table**

The Ringswitch supports the configuration of a filtering table that applies to transparent-bridged frames. You can define up to 255 entries in the transparent filtering table, each specifying a destination address and the allowed ports on which frames can be transmitted. Addresses in the filtering table will override defined virtual LANs when forwarding to allowed ports.

## **Source-Route Transparent Bridging**

Source-Route Transparent (SRT) is a technique that enables Source-Route Bridging and Transparent Bridging to co-exist in the same network. Frames that contain routing information are forwarded using the Source-Route Bridging technique, and frames that do not contain routing information are forwarded using the Transparent Bridging technique.

When the SRT mode is enabled, the Ringswitch performs in the same way as a source-route bridge and a transparent bridge in parallel. The Ringswitch examines incoming frames to find out whether the Routing Information Indicator (RII) bit is set. If the RII bit is set, the frame also contains a Routing Information Field (RIF). Incoming frames with the RII bit set are treated as source-route frames, while frames without routing information are treated as a transparent-bridged frames.

Although SRT enables Source-Route Bridging and Transparent Bridging to co-exist on the same network, it does not enable communication between stations on source-routed token-ring LANs and stations on Ethernet LANs.

---

In SRT mode, all Ringswitch ports must have a unique ring number so that source-routed frames can be forwarded to the appropriate port. Use SRT bridging where all switches and bridges support SRT bridging, or in conjunction with source-route bridges and transparent bridges. Ensure that the Spanning Tree algorithm will generate a valid path for all frame types under all conditions (see “Spanning Tree Protocol” later in this chapter).

## Source-Route Transparent Plus Bridging

Source-Route Transparent Plus (SRT+) Bridging is a bridging technique, developed by Madge Networks, that combines the benefits of Source-Route Bridging and Transparent Bridging while allowing the same ring number to be used on multiple ports.

SRT+ bridging is an enhanced version of the SRT bridging technique. It allows the same ring number to be assigned to more than one port. This means that you can segment overloaded or heavily loaded rings to improve network performance without the need to introduce additional ring numbers. This type of segmentation typically involves the allocation of new ring numbers and requires a significant amount of management effort. SRT+ eliminates this burden and makes ring segmentation easy to implement.



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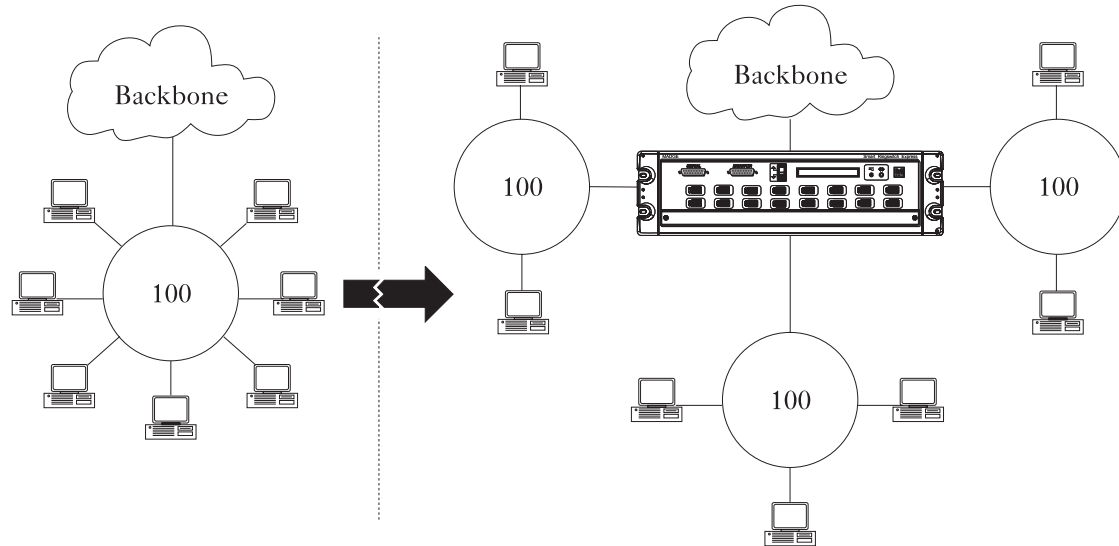
**Caution:** Make sure no other source-routing devices, such as bridges and switches, are connected to ports with non-unique ring numbers.

---

In the example, a congested user ring is shown being segmented into three smaller rings while retaining the original ring number across all three ring segments.

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*Figure A.6 Segmenting congested user rings with SRT+ bridging*



In SRT+ mode, the Ringswitch forwards frames that contain routing information, using the source-route bridging technique, if the output ring number is uniquely assigned to a port. If the frame contains routing information but is destined for an output ring that is not uniquely assigned, the Ringswitch uses the transparent forwarding table to determine which is the appropriate output port.

The Ringswitch forwards frames that do not contain routing information using the transparent bridging technique. The Ringswitch also uses transparent bridging to forward frames between ports that have the same ring number.

---

Use SRT+ bridging where all switches and bridges support source-route bridging, SRT bridging, or SRT+ bridging. Ensure that the Spanning Tree process will generate a valid path for all frame types under all conditions.



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**Note:** Some source-routing bridges that check the ring number in IBM Spanning Tree protocol frames do not interoperate with the Ringswitch in SRT forwarding modes.

---

## Spanning Tree Protocol

The Ringswitch can use either the IBM or IEEE 802.1D Spanning Tree Protocol to determine the best path for frames when there are multiple path routes in a network. The Ringswitch uses a common Spanning Tree process to determine paths between rings for both source-route bridging and transparent bridging. This means that where multiple paths exist between rings, one of the paths will be selected and it will be used for both source-route Spanning Tree Explorer (STE) frames and transparent-bridged frames.

The Spanning Tree protocol is selected as follows:

- the IBM-compatible Spanning Tree Protocol is supported widely by source-routing bridges and switches. If the forwarding mode allows source routing only, the Ringswitch uses the IBM Spanning Tree Protocol
- the IEEE 802.1D Spanning Tree Protocol is backwardly compatible with most devices that support the IBM protocol, but supports transparent and SRT forwarding modes. If the forwarding mode is transparent, SRT, or SRT+, the Ringswitch uses the IEEE Spanning Tree Protocol

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## Simple Spanning Tree operation

If there are two bridges connecting the same two LANs, for example to provide network resilience, the Spanning Tree Algorithm (STA) ensures that duplicate frames do not appear (see Figure A.7).

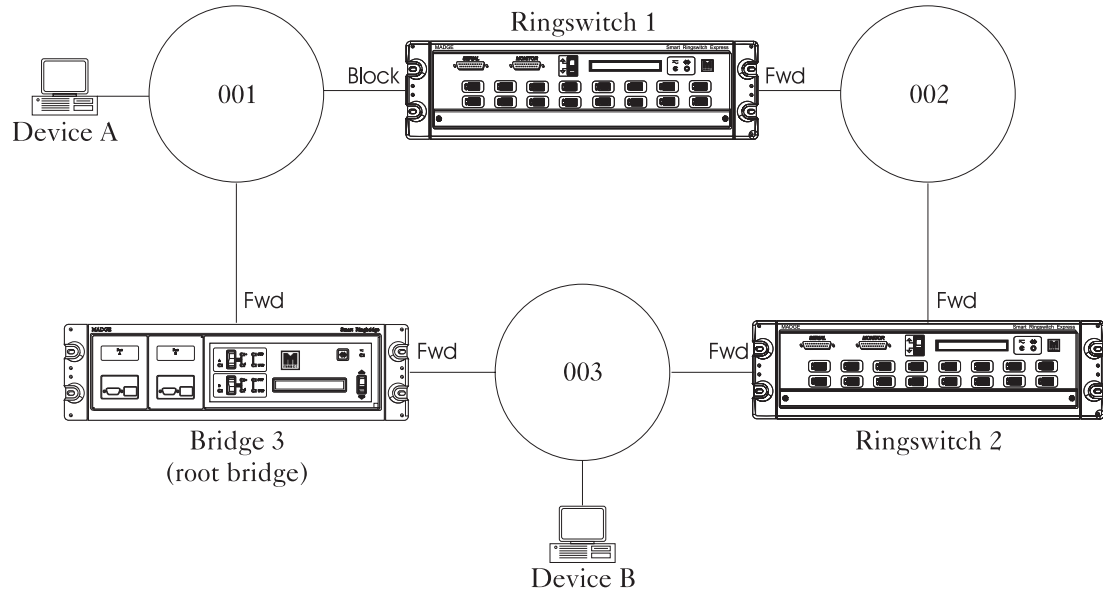
When the network becomes active, bridge ports exchange Spanning Tree messages to establish which bridge will become the root bridge. When the root bridge is established, one port of the bridges that occur in a duplicate path is put into the blocked state to prevent the duplicate connection. Bridge ports that are not in a duplicate path are put into the forwarding state.

When the network is running, all bridges periodically exchange messages to verify the integrity of the network configuration. If the root bridge moves into the disabled state or is removed from the network, the process to establish the root bridge restarts. The bridges on the network reconfigure and remain in a stable and valid configuration. The reconfiguration of the spanning tree may cause a loss of connectivity for a short period of time, as ports move from the blocking state through to the forwarding state.

When a port is in the blocked state it does not forward transparent-bridged frames or source-routed STE frames, but continues to forward source-routed All Routes Explorer (ARE) and non-broadcast frames.

In the example, there are duplicate paths between device A and device B. A port on Ringswitch 1 is put into the blocking state to prevent the duplicate connection.

Figure A.7 *Spanning tree operation*



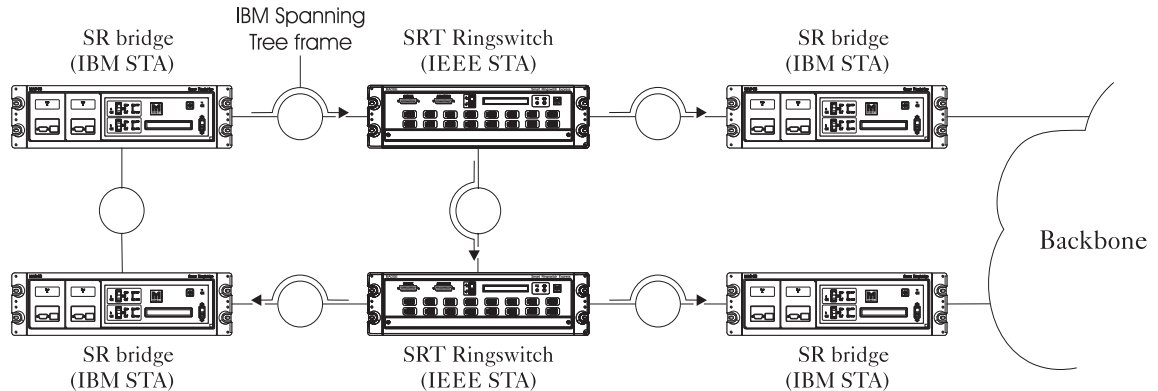
### Spanning Tree operation in a mixed network

The Ringswitch can use either the IBM or IEEE 802.1D Spanning Tree Protocol to determine the best path for frames when there are multiple path routes in a network. The Ringswitch uses a common Spanning Tree process to determine paths between rings for both Source-Route Bridging and Transparent Bridging. If you use mix Source-Route Bridging and Transparent Bridging in the same network, configure all Ringswitch devices to support SRT or SRT+ bridging.



Both Spanning Tree Protocols cause bridges and switches to communicate using Spanning Tree configuration messages. However, the IEEE 802.5 Spanning Tree Protocol sends Spanning Tree configuration messages to the bridge group address, whereas the IBM protocol sends messages to the bridge functional address. When all the Ringswitch devices on the network are in SRT mode, they form a spanning tree using the IEEE protocol as shown in Figure A.9.

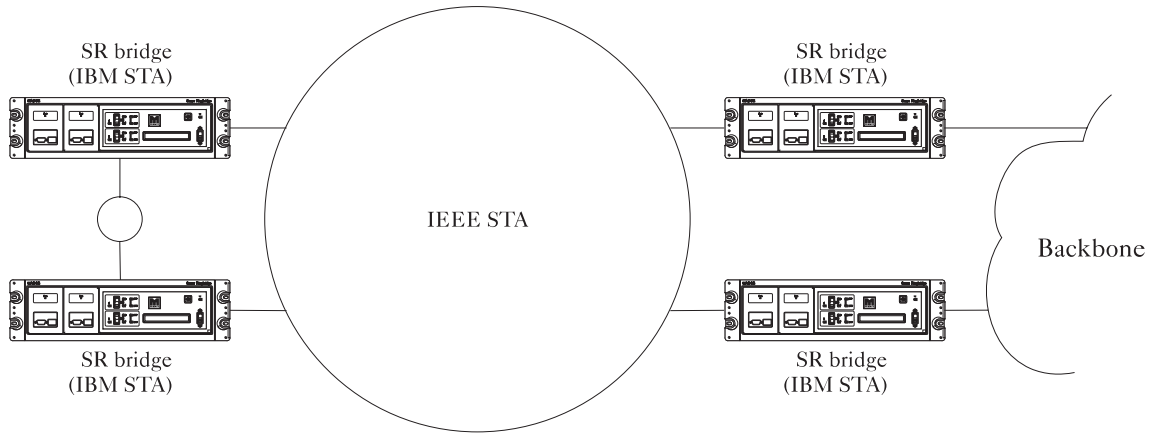
*Figure A.9 Connecting the Ringswitch in SRT mode to IBM Spanning Tree bridges*



The Ringswitch uses transparent bridging to flood all ports with IBM Spanning Tree frames so source-routing bridges that use the IBM protocol and are connected to those rings, behave as if they were all the same ring. For example, Figure A.9 shows the actual design of a network and the way Ringswitch devices flood all ports with an IBM Spanning Tree frame, and Figure A.10 shows the appearance of the same network to the bridges using the IBM protocol.

---

*Figure A.10 Ringswitch devices in SRT mode as they appear to IBM Spanning Tree bridges*



**Note:** Some source-routing bridges that check the ring number in IBM Spanning Tree Protocol frames do not interoperate with the Ringswitch in SRT forwarding modes. If you have bridges that are not interoperable, design the network to avoid parallel paths or configure the Ringswitch devices on the network for source routing only.

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## Overriding the Spanning Tree Protocol

The implementation of the Spanning Tree Protocol ensures that any duplicate paths in the network are detected and removed by automatically blocking the required number of ports on one or more switches. However, the Ringswitch can be configured to override the standard Spanning Tree Protocol settings to extend the scope of Transparent Virtual LANS in cases where the network topology is thoroughly understood.



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**Warning:** Do not attempt to override the Spanning Tree Protocol unless you understand thoroughly the topology of the network. Misconfiguration can lead to the creation of duplicate paths between Ringswitches which can flood the network with broadcast frames, causing endstations to become unstable or crash. Therefore the override options are not suitable for networks that undergo constant change, or that are not under the strict control of the Network Manager.

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## Path cost

The Spanning Tree Protocol has a weighting mechanism used to determine the optimum path for forwarding traffic. If there is a parallel path in a network where one is an HSTR link and the other a 16Mbit link, it is important that the HSTR link is chosen by the spanning tree to forward the frames. This is done by lowering its path cost.

In software releases before Release 3.3, the default spanning tree path cost was 100. In Release 3.3 and above, Madge has added a new feature called Auto Path Cost. To configure this, use Trueview and enable “Automatically select cost” in the Spanning tree dialog box. When the Ringswitch uses Auto Path Cost, the path cost becomes:

$$\frac{1000}{x}$$

where x is the speed of the media connected to the port. Hence:

- when the speed is 4Mbps, the path cost is 250
- when the speed is 16Mbps, the path cost is 62
- when the speed is 100Mbps the path cost is 10

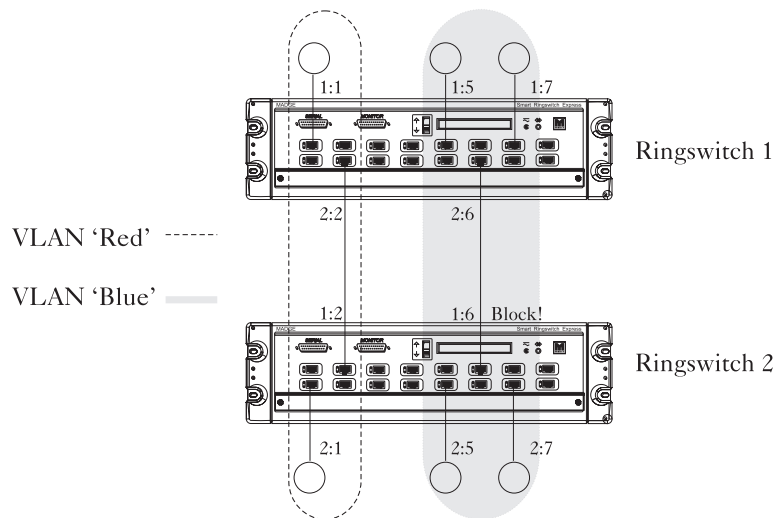
Madge recommends that you use Auto Path Cost. If your Ringswitch was manufactured with Release 3.3 or above, the default is Auto Path Cost enabled. If you upgrade your Ringswitch to Release 3.3 or above, unless you default the configuration or set the path cost to Auto Path Cost by using TrueView your ports will inherit the existing path cost value.

## Advanced configuration of Virtual LANs

Overriding the Spanning Tree Protocol allows Transparent Virtual LANs (VLANs) to be extended across an entire network, rather than confined to a single switch.

By extending the VLANs across the links between the switches, frames on each VLAN can be transferred between the switches while maintaining the separation of each VLAN's frames. This is displayed in the following diagram.

*Figure A.11 Extended VLANs across the links between two switches*



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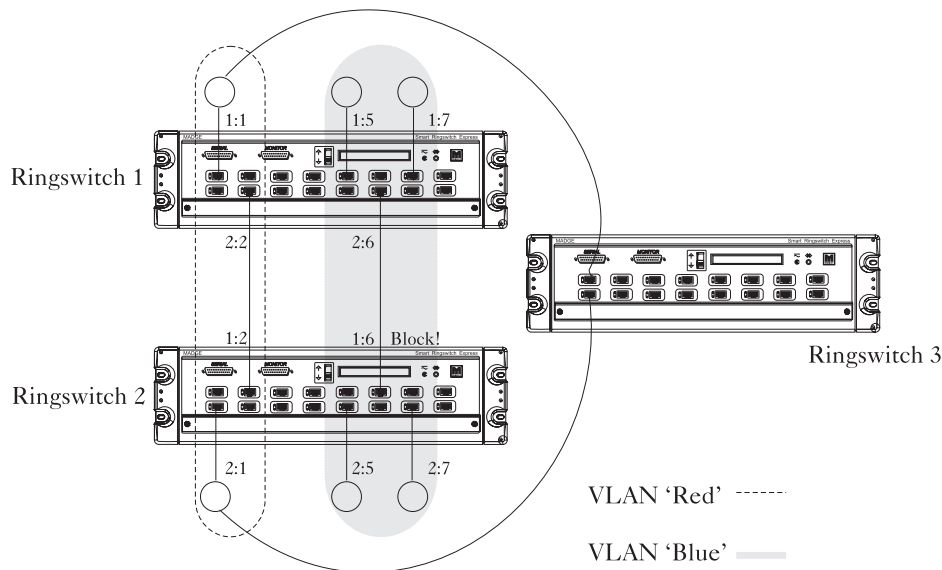
However, with the default Spanning Tree settings, one of the inter-switch link ports would be put into the Blocking state, which would stop frames on one of the VLANs being transferred. In this scenario, Port 1:6 on Ringswitch 2 is Blocking, which will not allow frames on VLAN Blue to be passed between the two switches. The default Spanning Tree settings, used to prevent any loops in the network topology, need to be overridden to make this configuration work as required. There are two methods used to achieve this; the slave to port option and the Force Transparent option.

### **Slave to port option**

The slave to port option allows a port to be configured so that it forwards Transparent Frames on the basis of another port's Spanning Tree state. In Figure A.11, Port 2:2 should be slaved to Port 2:1 on each Ringswitch. This VLAN configuration then allows forwarding on all inter-switch link ports. The Network Manager must manually configure the network so that the Transparent VLAN configuration does not contain any loops. In a network with more than two Transparent VLANs, extra inter-switch links could be used, all configured to be slaved to Port 2:1.

The slave to port option provides some protection against the accidental creation of a loop. For example, the following diagram shows an illegal configuration of our example network, where another switch has been installed between the Red LANs on each Port 1:1 of the two switches.

Figure A.12 An illegal configuration



The normal Spanning Tree operation would ensure that the potential forwarding loop was removed. If this caused Port 2:1 on either switch to go into Blocking state, connectivity would also be lost for the Blue VLAN, since the Blue VLAN's link ports follow the state of the Red VLAN's link ports.

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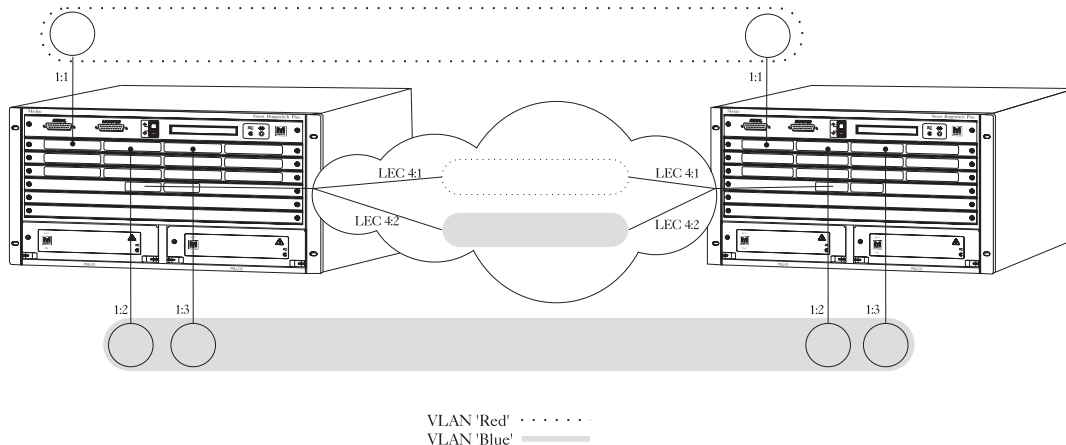
### **Force Transparent option**

This management option allows you to configure a port to forward transparent frames at all times. Since the port does not participate in the Spanning Tree Protocol, exercise caution when configuring a switch to use the Force Transparent option because there is no protection against forwarding loops. The Network Manager must ensure that the Transparent VLAN configuration of all the switches does not contain any loops. If the configuration displayed in Figure A.12 were used with the Force Transparent option, a forwarding loop would be established.

## **Multiple LECs**

Up to 16 LAN Emulation Clients (LECs) can be supported on an ATM module when it is installed in one of the bottom three slots of a Smart Ringswitch Plus Chassis. When ATM is being used as the network backbone, either of the Spanning Tree override options can be used in conjunction with multiple LECs to provide Transparent VLAN connectivity across the ATM backbone. The following diagram shows an equivalent configuration to Figure A.11, but using an ATM backbone with multiple LECs. LEC 4:2 is slaved to LEC 4:1.

*Figure A.13 Extended VLANs across the links between two switches incorporating an ATM backbone*



### Source routing

It is not necessary to use multiple LECs or Spanning Tree override to transport source-routed VLAN information across a network. Membership of a source-routed VLAN is on the basis of the ring numbers, which are carried in all source-routed frames.

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## Connecting Ethernet and token-ring LAN segments

If you install a Smart Ringswitch 2-Port Ethernet Module into a Smart Ringswitch Plus Chassis or a Smart Ringswitch Express you can connect token-ring LAN segments with Ethernet LAN segments. The Ethernet Module provides a high bandwidth solution for connecting the two different network types. You can also use the Ethernet Module to allow large token-ring networks to access small Ethernet segments containing printers, scanners, and other peripherals for which token- ring interface cards are not readily available.

The Ethernet Module acts as a translational bridge performing frame format conversion between the two network types. The nature of the conversion depends on network protocol and the bridging mode of the module. For more information about frame format conversion, see Appendix F, Token ring and Ethernet conversion. For information about using the Ethernet Module see Chapter 6, Connecting Ethernet ports, or refer to the online help provided with TrueView.

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## Third Layer Services

Installing a Smart Ringswitch TLS Module in a Smart Ringswitch Plus Chassis or a Smart Ringswitch Express allows you to separate IP subnets that share the same layer 2 interconnected network. Filters in the Ringswitch check the subnet information of IP frames so as to partition traffic into a maximum of 16 directly attached subnets per TLS Module. IP (v4) traffic that needs to travel between subnets is routed by the TLS Module. The TLS Module supports RIP and OSPF routing protocols. It also supports Virtual Router Redundancy Protocol (VRRP) and BootP/DHCP Relay Agent. For information about using the TLS Module see Chapter 10, Configuring the Smart Ringswitch TLS Module, or refer to TrueView Online help.

### IP routing

Unlike bridging, which transports data from source to destination in one “hop”, IP routing works by breaking the path between the source and destination into a series of “hops” across IP routers. At each hop, the receiving router chooses the router to which it will send the data by examining the final IP destination and the current topology of the network (learned via management or routing control protocols such as RIP and OSPF). When the sending router determines the IP address of the next hop, it rebuilds the MAC header of the frame giving it the MAC address (determined using the ARP protocol) of the next hop as its destination. It then transmits the frame to the next router. This process continues until the frame is delivered to the final destination.

---

## **Address Resolution Protocol (ARP)**

When a router has determined the IP address of the next hop, it must determine the MAC address of the hop to build the MAC header of the frame. The router maintains a table of mappings between IP addresses and MAC addresses. In a source-routing environment, the table also includes the RIF for the path to the IP node. IP routers and end nodes dynamically maintain the ARP table.

When a router requires a MAC address for an IP address that is not in the table, the router broadcasts an ARP request frame onto the local subnet. The end node with the assigned IP address sends the router an ARP response frame containing the MAC address to be used, and the router records this in the ARP table. The router also learns any corresponding RIF information for the IP node from the ARP response frame.

ARP tables have associated aging timers which remove entries that have not been referenced for a certain period of time. These timers are typically set to ten minutes.

## **Routing Information Protocol (RIP)**

RIP is one of the routing control protocols used by IP routers to exchange information about the current network topology. A router running RIP broadcasts a message every thirty seconds containing information about the router's current routing database. The information describes which networks the router knows about and their distance (expressed as the number of hops) away from the router.

The original version of RIP (v1) does not pass subnet information about networks in the RIP messages. RIP v2 includes this information and has rudimentary security capabilities.

---

### **Open Shortest Path First (OSPF)**

OSPF is another routing control protocol which, although more complicated than RIP, has the benefit of scaling better in bigger networks by allowing networks to be partitioned into areas.

Unlike RIP, which is a distance-vector protocol, OSPF is a link-state protocol. An OSPF router actively tests the status of the links to each of its neighbors. This information is then exchanged with its neighbors which propagate it throughout the network. Each router takes this link-state information and builds a complete routing table.

Like RIPv2, OSPF supports subnets and simple authentication.

### **BootP/DHCP Relay Agent**

BootP/DHCP servers are usually required to provide IP addresses to BootP/DHCP clients that are located on more than one IP subnet in a network. To use the BootP/DHCP Relay Agent, you must enable BootP/DHCP Relay Agent on any router(s) between the BootP/DHCP server and the BootP/DHCP clients. The Relay Agent simply adds subnet information to the BootP/DHCP client's request so that the BootP/DHCP server knows from which subnet range to assign the client's IP address.

### **Virtual Router Redundancy Protocol (VRRP)**

IP clients where default gateway IP address can only be configured manually will lose IP connectivity if that default gateway fails or has to be brought down for maintenance reasons. Virtual Router Redundancy Protocol (VRRP) provides such clients with a backup router (that has the same IP address). Unlike some other solutions to this problem (for example, IRDP), VRRP requires no additional functionality at the client. The TLS VRRP implementation is also fully compatible with Ringswitch layer 2 functionality such as spanning tree.

---

## Suggested further reading for IP routing

### Books

- Comer, Douglas. 1991. *Internetworking with TCP/IP: Volume I*. USA: Prentice Hall. (ISBN 0-13-468505-9)
- Perlman, Radia. 1992. *Interconnections: bridges and routers*. USA and Canada: Addison-Wesley. (ISBN 0-201-56332-0)
- Stevens, W. Richard. 1994. *TCP/IP Illustrated: the protocols*. USA and Canada: Addison-Wesley. (ISBN 0-201-63346-9)

### RFCs

- RFC1812: *Requirements for IP Version 4 Routers*. Baker, F. Cisco Systems. June 1995
- RFC1058: *Routing Information Protocol (RIP)*. Hedrick, C. Rutgers University. June 1988
- RFC1583: *OSPF Version 2*. Moy, J. Proteon, Inc. March 1994

# Configuring Active Broadcast Control

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## About broadcast frames

LAN technologies such as Ethernet and token ring enable any station to broadcast a frame to all other stations on the LAN. Almost all networking protocols use broadcasts to implement operational and administrative mechanisms, such as enabling clients to register with servers, and allowing networked resources to advertise their services.

Because LAN switches enable the interconnection of many LAN segments, the number of broadcast frames generated on a switched LAN can be high. Source routing also uses source-route explorer frames, which can be replicated when there are multiple paths through a bridged network.

In a large corporate network designed with considerations such as fault-tolerance and load balancing in mind, a means of controlling these frames is required to reduce the proportion of bandwidth occupied by broadcast traffic and to minimize the likelihood of broadcast storms.

---

Some common broadcast protocols are described in Table B.1.

*Table B.1 LAN broadcast protocols*

Broadcast protocol	Source	Purpose	Typical frequency
Service Advertising Protocol (SAP)	NetWare servers	Informs other NetWare servers about available services	Once per minute from each server
	NetWare clients	Locates nearest server	When client shell is loaded
Routing Information Protocol (RIP)	IPX routers	Informs other routers about network topology	Once per minute from each router
Address Resolution Protocol (ARP)	IP stations	Learns the MAC address associated with an IP address	Once every five minutes for each connection
Netbios Add Name Query	Netbios stations	Ensures no duplicate name exists	When a Netbios-based application is loaded
Netbios Name Query		Learns the MAC address	

---

## Active Broadcast Control techniques

Active Broadcast Control (ABC) features enable the Ringswitch to determine where certain types of broadcast frame should be sent. This means the Ringswitch can avoid sending those frames elsewhere, which reduces the amount of broadcast traffic on the LANs interconnected by the device.



**Note:** When you enable an ABC filter, it applies to all the broadcast traffic received by the Ringswitch. You cannot define ABC filters for specific ports or virtual LANs.

---

TrueView Ringswitch Manager enables you to configure seven filters that each filter a particular kind of broadcast frame. All the ABC filters, except for the All Routes Explorer (ARE) filters, apply to all forwarding modes. The ARE Filtering and ARE Conversion features only apply to source-routed networks.



**Note:** You cannot configure ABC techniques using the command-line interface.

---

---

The ABC filters are listed below, together with the abbreviated name that is shown in TrueView Ringswitch Manager:

- Workstation Ring Filtering
- Token Ring ARE Filter (AreFilter)
- Token Ring ARE Conversion Filter (AreConv)
- IP ARP Filter (IPArp)
- Netbios Name Filter (NBName)
- Netbios ADD\_NAME\_QUERY Filter (NBAdd)
- IPX RIP/SAP Suppression Filter (IPXRip)
- IPX Type 20 Filter (IPX20)

By default, all the ABC filters are disabled. Before enabling ABC filters, make sure the filter is applicable to your network then use TrueView Ringswitch Manager to monitor the effect of applying the filter. Monitoring the effectiveness of each filter in turn enables you to evaluate the improvement in network performance that you can expect.



**Note:** The effectiveness of ABC filters depends on the architecture of your network and the configuration of the Ringswitch. If a filter does not help control broadcast frames on your network, do not enable the filter.

---

For information about using TrueView Ringswitch Manager to configure ABC filters, refer to the booklet accompanying the Smart Ringswitch CD.

---

## Workstation ring filtering

To reduce unnecessary broadcast traffic, you can define the type of stations that are connected to each Ringswitch port. For IPX and Netbios protocols, the Ringswitch uses information about the type of station to block broadcast frames originating on workstation-only rings and destined for other workstation-only rings.

The Ringswitch performs port-to-port blocking on workstation rings for all IPX and Netbios all-routes broadcast and single-route broadcast frames, except for ADD\_NAME\_QUERY and ADD\_GROUP\_NAME\_QUERY Netbios frames.

## ARE filtering (AreFilter)

On a source-routing network, when a device needs to establish a session with another device that is connected to a remote LAN, it may send an All Routes Explorer (ARE) frame to discover all possible routes to the other device (see “Source-Route Bridging” in Appendix A, Network design issues).

In many networks, the use of ARE frames in the route discovery process can improve network performance, because it results in load sharing. However, in a large switched network in a mesh pattern, the use of ARE frames means that a very large number of frames arrive at each ring, resulting in network congestion.

The traditional method for avoiding such network congestion is to set hop count limits for each port on the switch. This is difficult to set up and manage, and can result in loss of connectivity if it is set up incorrectly.

The ARE filtering broadcast control feature intelligently filters unnecessary ARE frames. When you enable ARE filtering, the Ringswitch compares each ARE frame it receives with historical information about the ARE frames it has already forwarded. If the new frame has a worse route, indicated by a longer Routing Information Field (RIF), than the last frame, it is discarded. If the frame has a better route, indicated by a shorter RIF, it is forwarded.

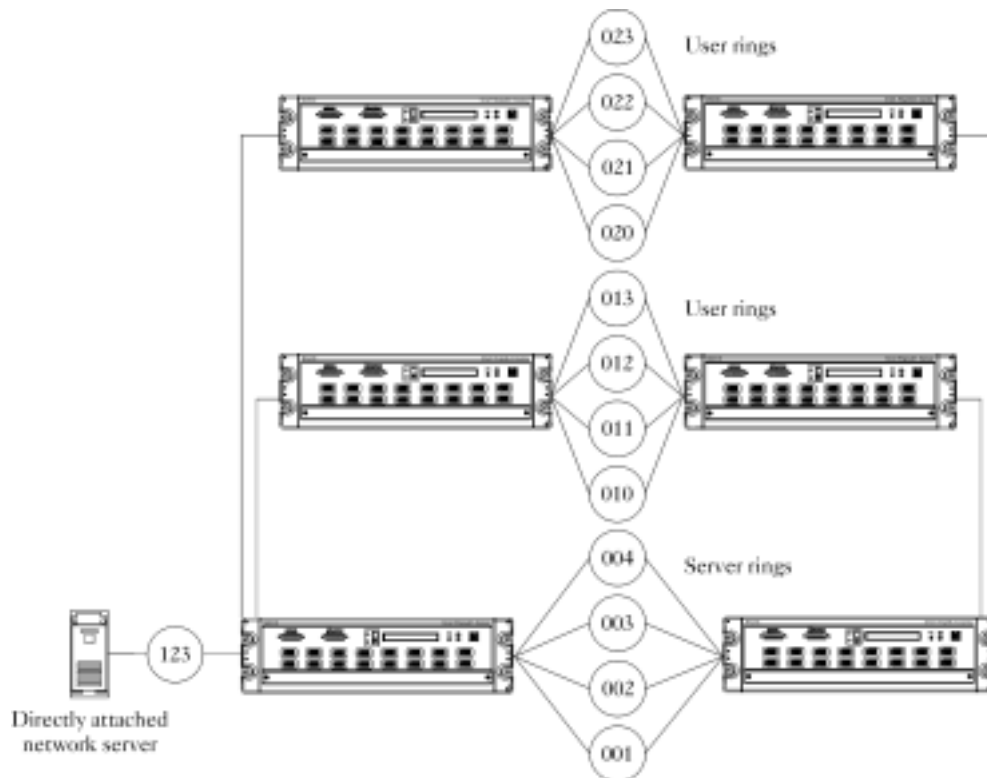
---

The following example shows the benefit of applying ARE filtering. Table B.2 and Figure B.1 show the number of ARE frames generated and filtered when a frame is sent from a user ring to a user ring, from a server ring to a user ring, and from a directly-attached server to a user ring.

*Table B.2 ARE frames generated with ARE filtering enabled and disabled*

ARE frame	Frames generated with ARE filtering disabled	Frames generated with ARE filtering enabled
User ring 023 to user ring 013	40	2
Server ring 001 to user ring 012	8	2
Server ring 123 to user ring 010	36	2

*Figure B.1 ARE filtering broadcast control in a mesh network*



The use of ARE filtering reduces the number of frames arriving at each ring to two per broadcast.

---

## ARE conversion (AreConv)

Source-routing stations discover routes using one of the following broadcast techniques:

- All Routes Explorer (ARE)

Frames are sent out that traverse every possible route to the destination.

- Spanning Tree Explorer (STE)

The Spanning Tree algorithm ensures that only one path between the source and destination rings is used. The use of STE frames significantly reduces the amount of broadcast traffic.

However, some protocol stacks only support ARE frames, so the ARE conversion broadcast control feature can be used to selectively convert ARE frames into STE frames.

ARE conversion determines whether the Ringswitch converts ARE frames into STE frames, so that only one copy of the frame is forwarded to each ring.



**Note:** ARE conversion is only recommended where the feature has been enabled in previous releases of Smart Ringswitch software. ARE conversion causes a higher proportion of traffic to be sent using the spanning tree, and may not take full advantage of other valid paths through the network. Therefore, you should use ARE filtering unless it is unsuitable for the design of your network. Do not combine ARE filtering with ARE conversion.

---

---

You can configure ARE conversion using the settings described in Table B.3.

*Table B.3 ARE conversion settings*

Setting	Description
Enable first	Converts all ARE frames that have a RIF length of 2. This means the Ringswitch is the first bridge or switch the frame has encountered.
Enable all	Converts all ARE frames to STE frames.
Enable bcast first	Converts all ARE frames with the broadcast destination address (FFFFFFFFFFFF) and a RIF length of 2. This means the Ringswitch is the first bridge or switch the frame has encountered.
Enable bcast all	Converts all ARE frames with the broadcast destination address (FFFFFFFFFFFF).
Disable	Does not convert ARE frames to STE frames.

### **IP ARP address caching (IPArp)**

Stations using the Internet Protocol (IP) use Address Resolution Protocol (ARP) frames to locate other stations on the network. If an IP station wants to communicate with another IP station, it must first find the MAC address of the other station by sending out an ARP broadcast frame containing the IP address of the station it wants to communicate with. When the sender has resolved the MAC address for an IP address, it can send frames to it.

---

The Ringswitch monitors network traffic and builds a list of known addresses by reading the IP address of the destination device that is present in frames. In a source routing environment, the list maps IP addresses to ports. In a transparent bridging environment, the list maps IP addresses to MAC addresses.

This provides the Ringswitch with the location of IP devices. Therefore, when the Ringswitch receives an ARP frame, it can forward it directly to the port where the destination device is located. If the Ringswitch does not receive an ARP frame for an address that it has learned within a specified period, the address is removed from the list of known addresses.



---

**Note:** If an IP station has multiple adapter cards for a single IP address, and they are connected to different token rings, ARP address caching may cause all traffic to be routed to one of the adapter cards.

---

In source-routed environments, ARP address caching works best if all IP stations use the same type of explorer for ARP frames, and issue an ARP frame before replying to a frame from another station.

---

**Netbios ADD\_NAME\_QUERY retry control (NBAdd)**

The Netbios ADD\_NAME\_QUERY retry control enables you to make the Ringswitch control the forwarding of multiple copies of ADD\_NAME\_QUERY frames.

Every station on a network running the Netbios protocol has several names.

There are two kinds of name:

- unique names identify individual stations on the network
- group names are used to identify groups of stations. For example, a group name may identify a logical workgroup

When stations on a network running the Netbios protocol start up, they transmit ADD\_NAME\_QUERY frames (Netbios ID X'01') as STE frames to check that no other station is using the same name. To ensure reliability, most Netbios implementations transmit multiple copies of the same frame. On a large network, the STE frames can cause significant traffic, particularly if a large proportion of the stations start up simultaneously.

The Netbios ADD\_NAME\_QUERY retry control allows the Ringswitch to limit the number of retries issued by a station. You can configure the number of retries that are permitted, to reduce congestion and maximize network performance.

---

## Netbios name caching (NBName)

Beside the ADD\_NAME\_QUERY frame (see “Netbios ADD\_NAME\_QUERY retry control (NBAdd)”), stations on a network running the Netbios protocol use a range of other frames that are broadcast across the whole network. The frames are used for locating other network resources and sending messages. The address of the sending station is included in all frames.

The frames broadcast on a Netbios network are described in Table B.4.

*Table B.4 Netbios broadcast frames*

Frame	ID	Purpose
STATUS_QUERY	X'03'	Requests the status of a named station
DATAGRAM	X'08'	Sends a message to a named station
DATAGRAM_BROADCAST	X'09'	Sends a message to all stations
NAME_QUERY	X'0A'	Finds the location of a named station
NAME_RECOGNISED	X'0B'	Responds to a NAME_QUERY

The Ringswitch uses the name of the sending station to build a cache of Netbios names. In a source routing environment, the Ringswitch maps Netbios names to ports. In a transparent bridging environment, the list maps Netbios names to MAC addresses.

Therefore, when the Ringswitch receives a Netbios frame, it can forward it directly to the port where the named device is located.

---

When a NAME\_QUERY frame is sent to a particular name:

- 1 The Ringswitch looks up the name in the cache and only forwards the frame to associated ports.
- 2 If there is no association for the Netbios name, the Ringswitch broadcasts the frame.
- 3 The Ringswitch waits to receive a NAME\_RECOGNISED frame in response.
- 4 If the Ringswitch does not receive a NAME\_RECOGNISED frame within a period of time, it removes the name from the cache so that successive NAME\_QUERY frames will be broadcast across the network.



**Note:** If you have multiple adapter cards in a single Netbios server, and they are connected to different token rings, Netbios name caching may cause all traffic to be routed to one of the adapter cards.

---



**Note:** Netbios name caching requires the Netbios clients to be able to issue NAME\_QUERY retries. Most Netbios clients issue retries.

---

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## **IPX RIP/SAP suppression (IPXRip)**

Novell NetWare servers make extensive use of broadcast frames, as they frequently send out Service Advertising Protocol (SAP) frames to locate other servers. Routers that support Novell NetWare also use broadcast frames, as they frequently send out Routing Information Protocol (RIP) frames to inform other routers about the network topology. Certain broadcast RIP and SAP frames only need to be sent to rings that have either servers or routers attached.

IPX RIP/SAP suppression enables the Ringswitch to suppress RIP frames sent out by routers that support Novell NetWare, and SAP frames sent out by Novell NetWare servers, on ports that do not have an IPX router or server attached. The default RIP/SAP suppression setting is disabled.

If IPX RIP/SAP suppression is enabled, the Ringswitch automatically learns which rings contain servers and routers that need to receive RIP and SAP frames, and only forwards RIP and SAP frames to those rings.

IPX RIP/SAP suppression ensures that rings that have only IPX workstations attached do not become unnecessarily congested with broadcast frames.

## **IPX Type 20 filtering (IPX20)**

Type 20 frames are the equivalent of All Routes Explorer (ARE) frames, except that they are used on IPX networks, where they primarily enable Netbios over IPX.

Besides the standard IPX header, a Type 20 frame can contain up to eight IPX network numbers. The frames are forwarded throughout the network by IPX routers. When forwarding a frame, if a router has a port on a network that does not appear in the frame, it modifies the header and forwards the frame to that port.

IPX Type 20 filtering helps reduce the number of Type 20 frames and prevents broadcast storms. When you enable IPX Type 20 filtering, the Ringswitch compares each Type 20 frame it receives with historical information about the frames it has already forwarded. If the new frame has a different network number or a shorter hop count, or has the same hop count and was received on the same port from the same router, then it is forwarded. Otherwise, the frame is discarded.

# Protocol Filtering

---

## About Protocol Filtering

Protocol Filtering enables you to:

- reduce broadcast traffic
- restrict access to certain areas of your network

## Protocol Filtering on the Ringswitch

Protocol Filtering is supported by Software Release 3.2 and later. Protocol Filtering restricts broadcast traffic to domains you have defined on the Ringswitch. To understand Protocol Filtering on the Ringswitch, we need to define certain terms.

### Domains

Domains are groups of ports on the Ringswitch that group users together. To differentiate between them in the Trueview Ringswitch Manager, domains are given a color. Frames that match the Protocol Filter (defined below) will only be forwarded to ports within the same domain as the originating port. A domain cannot be applied across multiple Ringswitches.

### Protocol Filters

A Protocol Filter is a template that incoming broadcast frames are compared against. For ease of use the Ringswitch Manager provides pre-defined values for the most common protocols, for example, IPX, NETBIOS, SNAP (IP, IPX, ARP), RPL request, RPL find, and Banyan Vines, but you can enter any value not listed by the Ringswitch Manager.

---

The Protocol Filters on the Ringswitch will only operate on broadcast traffic. Specifically addressed frames will be ignored.

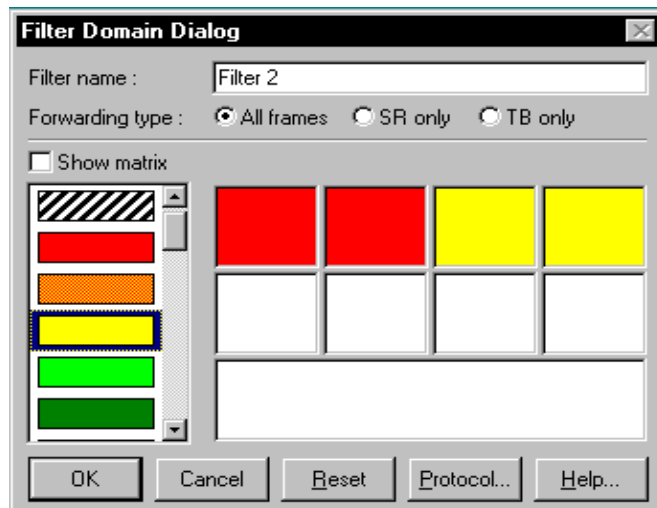
Broadcast traffic which the filter will act upon are:

- frames which contain All Routes Explorer or Spanning Tree Explorer information in the Routing Information Field
- frames addressed to FFFFFFFFFF
- frames addressed to a functional address i.e. an address in the range C00000000000 - C00040000000
- multicast frames

## The Filter Domain Dialog Box

In the Trueview Ringswitch Manager the Filter Domain Dialog represents ports on the Ringswitch.

*Figure C.1 The Filter Domain Dialog*



The rows of squares represent the rows of ports on the Ringswitch. For example, the top row of squares always represents the top row of ports on your Ringswitch. Initially, ports are colored white to indicate that they have no filter defined. Figure C.1 represents a Smart Ringswitch which has a Smart Ringswitch 4-Port TR Copper Module in Slots 1 and 2, and an ATM Module in Slot 3.

---

To define a domain, select a color, and color the ports you want to be in that domain. The Ringswitch Manager uses color only as a representation of domains and allocates colors sequentially, so may not preserve the colors you choose. Domains, however, are preserved. You may define as many domains as you need. Black and white stripes indicate a single port domain. If you only apply a color to a single port, when you return to the Filter Domain Dialog, this port appears as black and white stripes. Forwarding type refers to All frames, Source Route frames and Transparent Bridging frames.

---

## The Filter Protocol Dialog Box

When you click on the Protocol button, you see the Filter Protocol Dialog shown in Figure C.2.

*Figure C.2 Filter Protocol Dialog*



There are two ways to define a filter:

- use the combo boxes and choose a value
- supply a HEX value for the frame

Figure C.3 shows a Filter Protocol Dialog with IPX defined as the Protocol SAP value.

*Figure C.3 Filter Protocol Dialog with IPX value*

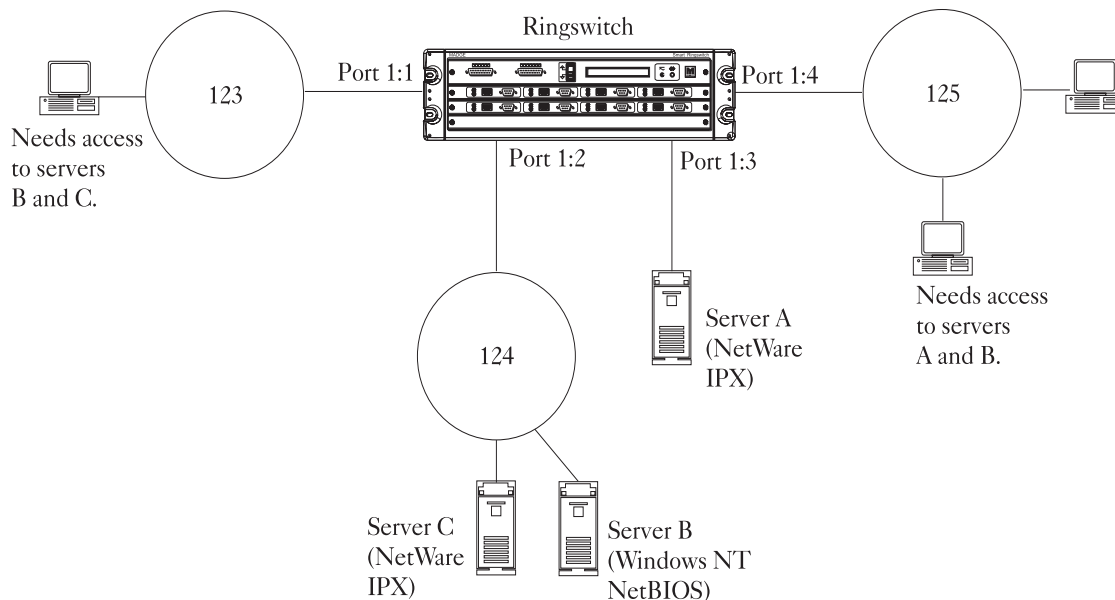
The image shows a 'Filter Protocol Dialog' window. It has a title bar with a close button. Inside, there's a 'Protocol' section with a 'SAP value' label. Below this is a dropdown menu showing 'E0-IPX' and a text field containing 'E0E0'. Below that is an 'IPX Header' section. It contains two labels: 'Destination address (network, node address, socket)' and 'Source address (network, node address, socket)'. Each label is followed by three input fields: a text box, another text box, and a dropdown menu. At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help...'.

When you select a value from the combo box, the correct HEX value is inserted in the Hexadecimal edit field in the correct place. When you change the SAP value, the dialog displays the appropriate fields. If you need to supply a value in any of these fields, you must supply the value in the correct form. For example, IPX needs a HEX value and IP needs a value of the form xxx.xxx.xxx.xxx.

## How to use Protocol Filtering

As an example of Protocol Filtering, we will use a network consisting of two groups of users who are connected via a Ringswitch to servers. By using Protocol Filtering, you can group users together into domains, give them access to the information they need, and restrict other users from information they do not need.

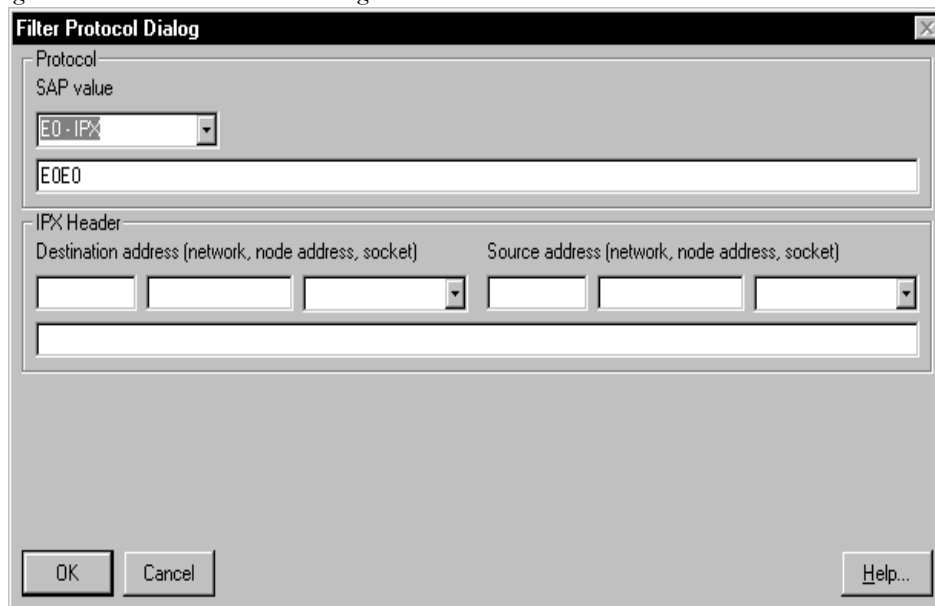
*Figure C.4 Protocol Filtering*



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In Figure C.4, User Ring 125 needs access to Server A using IPX and Server B, using NetBIOS, but not C using IPX. User Ring 123 needs to access Server C but not A. By using Protocol Filtering, you can configure the Ringswitch so that Ports 1:4 and 1:3 are in the same IPX domain and Ports 1:1 and 1:2 are in another, different, IPX domain. The filter domains shown in Figure C.1 and the dialog shown in Figure C.5 represent this example.

*Figure C.5 Filter Protocol Dialog*



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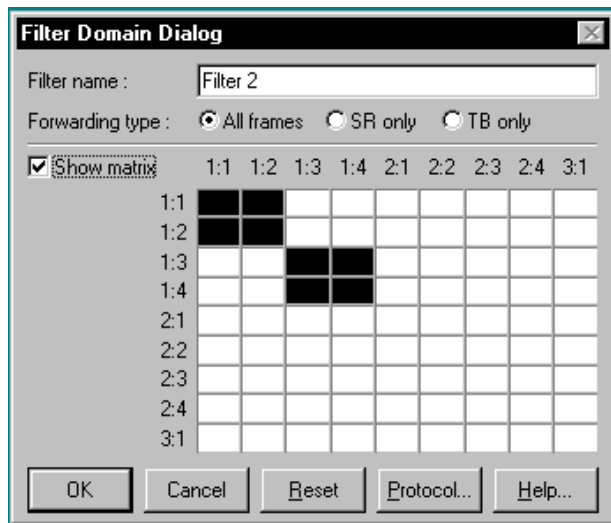
When an IPX broadcast frame is received by Port 1:1, it is forwarded to Port 1:2, the other port in the same domain. Similarly, when an IPX frame is received by Port 1:3, it is forwarded to Port 1:4, the other port in the same domain. NetBIOS frames are unaffected by the filter so Ring 125 can see Server B but not Server C.

---

## The Matrix method

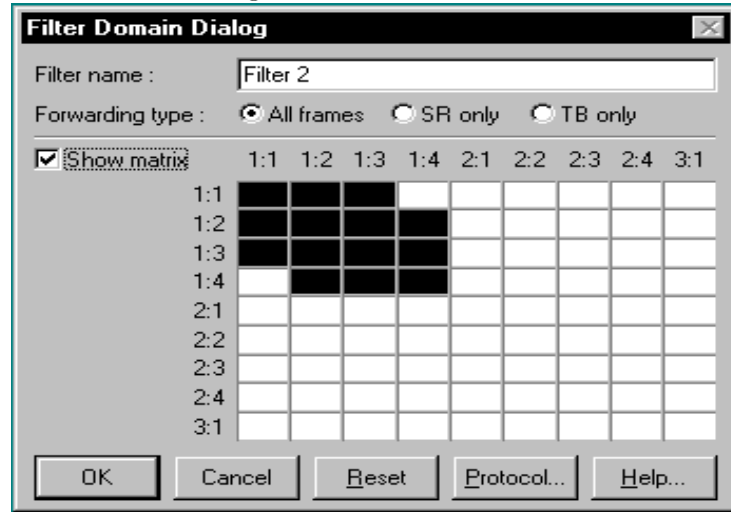
An advanced feature of the Filter Domain Dialog is Show matrix. Figure C.7 shows the Filter Domain Dialog with Show matrix activated. Using Show matrix enables the network manager to fine tune filtering. The matrix displays all permutations of where a broadcast frame can travel from each port. By clicking with your mouse on the matrix, you can select where a broadcast frame from any port will travel. Figure C.6 shows what you see if you select to view the matrix of domains that are configured in *Figure C.1*.

*Figure C.6 Filter Domain Dialog showing matrix view of domains from Figure C.1*



In Figure C.7, the filtering that you can see in Figure C.1 has been fine tuned to additionally define Ports 1:2 and 1:3 to be in different domains at the same time. The domain shown in Figure C.1 that included Ports 1:1 and 1:2 now also includes Port 1:3. The domain which included Ports 1:3 and 1:4 now also includes Port 1:2. This means that Ports 1:2 and 1:3 are common to both domains.

Figure C.7 Filter Domain Dialog matrix



**Note:** Take care when defining your filters, especially for TCP/IP, because the majority of IP frames first use an ARP request to locate devices; once a route is established then direct communication using the IP protocol takes place. Being direct (non broadcast), it will not be filtered. In this situation, it would be more effective to also target the SNAP-ARP frame to filter on.

---

## Configuring Protocol Filtering



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**Note:** You cannot configure Protocol Filtering using the command-line interface. You must use the TrueView Ringswitch Manager.

---

To set up Protocol Filtering:

- 1 Open the Protocol Filtering dialog.
- 2 Choose an unused Protocol Filter and click Edit.
- 3 Choose a Filter name in the Filter Domain Dialog.
- 4 Define domains or a subset of ports that the filter will apply to. A domain can either consist of a single port or a group of ports. To define domains, choose a color from the list on the left side of the dialog box and apply the color by clicking on the boxes that represent the ports.
- 5 Define the filter protocol to be used on the selected frame type and domains by clicking Protocol.

## About Remote Monitoring (RMON)

---

The Simple Network Management Protocol (SNMP) Remote Monitoring (RMON) standard provides a method for gathering and reporting information such as status data and traffic profiles to a network management station. The RMON Management Information Base (MIB) typically resides in an RMON probe, which may be a stand-alone device, a software component embedded in a device such as a hub or a bridge, or a software application that runs on a workstation.

An RMON probe is typically required to exist on each network segment, where it monitors and processes the data on the segment and stores the results in the RMON MIB. The network administrator can browse the contents of the MIB from either a SNMP management station or a specialized management system.



---

**Note:** Smart Ringswitch Software Releases 2.0 and later include RMON agent software. To use the RMON agent, you must obtain a Smart Ringswitch RMON License (part number: 84-27) from Madge Networks.

---

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You can enable RMON support in the Ringswitch, and in one or more ports, using TrueView Ringswitch Manager. For each port, you can define the type of frames that are passed to the RMON probe for inclusion in the RMON groups that you define for the switch. This enables you to selectively enable RMON for the types of frames you want to monitor, which reduces the number of frames that need to be processed by the RMON probe.



---

**Note:** Enable RMON on ports that are in classic half-duplex mode. Enabling RMON on full-duplex ports results in the logging of incomplete data.

---

You can access the RMON groups using TrueView Ring Manager, which is a token-ring network management system, or a third-party RMON management application.

## Ringswitch RMON support

The Ringswitch software contains an RMON probe that is controlled by industry-standard SNMP MIBs.

The RMON groups are defined in RFC 1757, “Remote Network Monitoring MIB”. The Ringswitch also supports the additional information specified in RFC 1513, “Token Ring Extensions to the Remote Network Monitoring MIB”.

---

The extensions are:

- 1 Token-ring MAC layer statistics table (MLStats) and MLStats history table are added to the segment statistics group.  
This table collects the MAC octets, MAC packets, ring purge events, ring purge packets, beacon event, beacon time, beacon packets, claim token events, claim token packets, NAUN changes, isolating errors (line errors, internal errors, burst errors, AC errors, and abort errors), non-isolating errors (lost frame errors, congestion errors, frame copied errors, frequency errors, and token errors), soft error reports, and ring poll events.
- 2 Token-ring promiscuous statistics table (PStats) and PStats history table are added to the segment statistics group.  
This table collects octets, packets, broadcast packets, multicast packets, and packets of length (18 to 63 octets, 64 to 127 octets, 128 to 255 octets, up to 18000 octets, and greater than 18000 octets).
- 3 A new token-ring group (MIB object ID mib-2.16.10) is added.  
The RMON support in the Ringswitch is controlled by the vendor-specific Madge Ringswitch MIB, MDGRSW.TXT. The Madge Ringswitch MIB does not provide additional RMON groups, or control the enabling of supported RMON groups, but controls the types of frames that are passed to the internal RMON probe for processing.

---

## Setting up the RMON probe

The Madge Ringswitch MIB (MDGRSW.TXT) defines whether RMON is enabled for Ringswitch ports, and the mode that determines whether all frames, MAC frames, or all frames to a specified address are processed.

All the variables in the Madge Ringswitch MIB can be changed by using TrueView Ringswitch Manager.

By default, the Ringswitch has no RMON groups enabled. To enable RMON:

- 1 Enable the RMON groups using TrueView Ring Manager or a third-party RMON management application.
- 2 Enable RMON support on the Ringswitch, and on one or more ports, using TrueView Ringswitch Manager.



**Note:** If the Ringswitch is reset, any existing RMON groups are lost, and must be re-enabled.

---

For each port on the Ringswitch, you can either disable RMON, or enable one of a range of modes of operation. The modes of RMON operation are:

- All Frames
- MAC Frames Only
- All Frames to Address

To fully support RMON on all ports, it would be necessary to put each port into All Frames mode, and the resulting processing and storage demand would significantly affect the performance of the Ringswitch.

---

The MAC Frames Only and All Frames to Address modes of operation are provided to enable you to limit the demands placed on the Ringswitch while retaining the ability to gather useful RMON data.

---



**Note:** When you enable RMON on a Ringswitch port, the port closes and re-opens to enable the Ring Error Monitor (REM) and Configuration Report Server (CRS) functional addresses. When you disable RMON, the port closes and re-opens to disable the functional addresses. The port does not need to close and re-open when you change the RMON mode.

---

### All Frames

In standard mode, all MAC and LLC frames appearing on the port interface are passed to the RMON probe for processing, including frames forwarded to the port by the Ringswitch.

### MAC Frames Only

If you configure ports to process MAC frames only, the REM and CRS functional addresses are enabled. The RPS functional address can be enabled or disabled independently; if RMON and RPS are enabled, RPS frames are processed by the RMON probe. The ports also pass MAC frames addressed to the Ringswitch port address, and sent from the Ringswitch port address, to the RMON probe.

All MAC frames with the following functional addresses are passed to the RMON probe:

- Ring Error Monitor (REM), address C00000000008
- Configuration Report Server (CRS), address C00000000010
- Functional broadcast, address C00FFFFFFF
- Ring Parameter Server (RPS), address C00000000002

---

## All Frames to Address

You can configure ports to process all frames to an address known as the ‘snoop address’.



**Note:** Earlier releases of the Token Ring Port Module hardware do not support the All Frames to Address mode.

---

This RMON mode means frames addressed to, or coming from, the snoop address that are received by the Ringswitch are passed to the RMON probe for processing. All MAC frames are also processed.



**Note:** Certain frames sent to the snoop address may not be processed by the probe for the ring to which they have been forwarded. See “Restrictions to the Segment Statistics group in the All Frames to Address mode” later in this chapter for more information about this restriction.

---

---

## RFC 1757 groups supported by RMON modes

RFC 1757 defines a range of groups that consist of a series of tables. The support for each group is determined by the RMON mode that is defined for Ringswitch ports.

The groups are:

- Segment Statistics (MIB object ID mib-2.16.1)
- History (MIB object ID mib-2.16.2)
- Alarms (MIB object ID mib-2.16.3)
- Host Table (MIB object ID mib-2.16.4)
- Host TopN (MIB object ID mib-2.16.5)
- Traffic Matrix (MIB object ID mib-2.16.6)
- Filters (MIB object ID mib-2.16.7)
- Packet Capture (MIB object ID mib-2.16.8)
- Events (MIB object ID mib-2.16.9)

### **Segment Statistics (MIB object ID mib-2.16.1)**

The Segment Statistics group provides packet statistics, including the number of packets, number of broadcast packets, and packet size distribution.

The token-ring statistics tables comprise the following tables:

- Token-ring MAC Layer Statistics (MLStats) Table, which collects information from the MAC layer including error reports and ring utilization
- Token-ring Promiscuous Statistics (PStats) Table, which collects utilization statistics from data packets collected promiscuously

---

The support that each mode provides to the Segment Statistics group is shown in Table D.1.

*Table D.1 Mode requirements of the Segment Statistics group*

RMON mode	Support
All Frames	Fully supports the MLStats and PStats tables. All counters provide accurate data
MAC Frames Only	All MLStats counters are accurate except the MacOctets and MacPkts counters, which only count the frames described in Table D.2, and the frames addressed to or coming from the Ringswitch. The PStats table is not supported
All Frames to Address	All MLStats counters are accurate except the MacOctets and MacPkts counters, which only count the frames described in Table D.2, and the frames addressed to or coming from the snoop address. The PStats statistics are gathered for the snooped frames only. Certain frames sent to the snoop address may not be processed by the probe for the ring to which they have been forwarded. See “Restrictions to the Segment Statistics group in the All Frames to Address mode” later in this chapter for more information about this restriction

The frames counted in the MAC Frames Only and All Frames to Address mode are shown in Table D.2.

*Table D.2 Frames counted for MacOctets and MacPkts statistics in MAC Frames Only mode and All Frames to Address mode*

Frame	Functional address	MIB entries affected
Ring Purge	Broadcast	RingPurgeEvents, RingPurgePackets
Beacon		BeaconEvents, BeaconTime, BeaconPkts
Active Monitor Present		RingPollEvents, BeaconTime
Standby Monitor Present		BeaconTime
Claim Token		ClaimTokenEvents, ClaimTokenPkts
NAUN Change	CRS	NAUNChanges
Report Error	REM	LineErrors, InternalErrors, BurstErrors, ACErrors, AbortErrors, FrameErrors, CongestionErrors, FrameCopiedErrors, FrequencyErrors, TokenErrors, SoftErrorReports

---

### **Restrictions to the Segment Statistics group in the All Frames to Address mode**

In the All Frames to Address mode, some frames that are forwarded to the Ringswitch are not passed to the probe for the ring to which they have been forwarded.

For example, RMON is enabled for ports 1 (ring 401) and port 2 (ring 402) in the All Frames to Address mode. The snoop address is set to 0000F65E02F1. This means frames addressed to, or coming from, that address that are received by the Ringswitch are to be passed to the RMON probe for processing.

The Ringswitch forwards the following four frames from port 1 to port 2:

1 Source-routed frame

Source address: 0000F65E02F1

Destination address: Any address

Routing information: 0600-401-1-402-0

The frame appears on rings 401 and 402. The frame is passed to the RMON probe for source ring 401 only.

2 Transparent-bridged frame

Source address: 0000F65E02F1

Destination address: Any address

---

The frame appears on rings 401 and 402. The frame is passed to the RMON probe for source ring 401 only.

3 Single-Route Broadcast (SRB) frame

Source address: 0000F65E02F1

Destination address: Any address

Routing information: C270

The frame is passed to the RMON probe for both source ring 401 and destination ring 402. The frame that is passed to the RMON probe for the destination ring has the correct routing information C630-401-1-402-0.

4 All-Routes Broadcast (ARB) frame

Source address: 0000F65E02F1

Destination address: Any address

Routing information: 8270

The frame appears on rings 401 and 402. The frame that is passed to the RMON probe for the destination ring has the correct routing information 8630-401-1-402-0.

---

### History (MIB object ID mib-2.16.2)

The History group provides historical views of the information in the Segment Statistics group. The group allows you to define sample intervals for trend analysis.

The History group comprises the History Control Table, which controls the periodic sampling of data from various types of networks. The table controls the sampling of data from token-ring networks.



**Note:** No data will appear in the table until the sample interval expires. For example, if the sample interval is 60 minutes, no data will be collected until one hour after sampling begins.

---

The sampled data is collected and stored in the following tables:

- Token-ring MAC Layer History Table, which collects the same statistics as the MAC Layer Statistics Table but for a sampled period only. The mode requirements are the same as those for the Segment Statistics group shown in Table D.1
- Token-ring Promiscuous History Table, which collects the same statistics as the Token-ring Promiscuous Statistics Table but for a sampled period only. The mode requirements are the same as those for the Segment Statistics group shown in Table D.1.

### Alarms (MIB object ID mib-2.16.3)

The Alarms group periodically takes statistical samples from variables in the probe and compares them to previously configured thresholds. If the monitored variable crosses a threshold, an event is generated. The group consists of the Alarm Table and requires implementation of the Events (MIB object ID mib-2.16.9) group.

---

Support for this group depends on the alarmVariable that has been set. The alarmVariable is any one of the MIB variables provided by the RMON probe; to determine the RMON mode requirements for specific MIB variables, refer to the other groups.

To set an alarmVariable, the alarmVariable must exist within the RMON probe. For example, if the alarmVariable is to be set to tokenringMLStatsBeaconEvents, the MLStats table must be present.

### Host Table (MIB object ID mib-2.16.4)

The Host Table contains information associated with each host discovered on the network. The group discovers hosts on the network by keeping a list of source and destination MAC addresses found in good packets promiscuously received from the network.

The Host Table group contains the Host Control Table and the Host Time Table. The Host Control Table controls which interfaces the function is performed on, and contains some information about the process. For each host, data is collected on an interface and placed in the Host Table and Host Time Table.

For each host, the following statistics are collected:

- in packets
- out packets
- in octets
- out octets
- out errors
- out broadcast packets
- out multicast packets



**Note:** The hostOutPkts and host OutOctets counters are not incremented for packets with errors.

---

---

Error counters are incremented by token-ring isolating errors as shown in Table D.1.

*Table D.3 Token Ring isolating error counters incremented by the Host group*

Isolating error	Error counters incremented
LineErrors	Increment the error counter for the station reporting the error and its Nearest Active Upstream Neighbour (NAUN)
BurstErrors	
ACErrors	Increment the error counter for the NAUN of the station reporting the error
InternalErrors	Increment the counter for the station reporting the error
AbortErrors	

For each host entry, CongestionErrors are also incremented for the host entry of the station that reports the error in an error report frame.

Support for the Host group provided by each mode is shown in Table D.4.

*Table D.4 Mode requirements of the Host group*

RMON mode	Support
All Frames	Fully supports the Host group tables. All counters provide accurate data
MAC Frames Only	<p>The host list is recorded from stations that have sent MAC frames to stations with specified MAC addresses. The list comprises all the local hosts on the interface.</p> <p>For entries of a host address other than the Ringswitch port, the 'in' counters do not increment and the 'out' counters only count frames that the host has sent to the broadcast, functional, or Ringswitch address.</p> <p>For entries that contain the Ringswitch port address as the host address, the statistics include all MAC traffic address to or destined for the Ringswitch</p>
All Frames to Address	Provides the same support as MAC Frames Only mode, and includes the hosts that are communicating with the specified address depending on the location of the host. If the host is local, all 'out' counters are accurate but the 'in' counters do not include certain frames forwarded from the snoop address onto the local ring

---

**Host TopN (MIB object ID mib-2.16.5)**

The Host TopN group is an extension of the host table, where the information is sorted into a list. For instance, the group provides the top ten stations transmitting data, and a list of stations generating network errors sorted by the number of errors generated. All the base statistics are available, over an interval specified by the management station. The group consists of the Host TopN Control Table and the Host TopN Table.

The mode requirements are the same as those for the Host group shown in Table D.4, except that All Frames to Address mode cannot support the Host TopN group.

**Traffic Matrix (MIB object ID mib-2.16.6)**

The Traffic Matrix group provides information about the traffic and errors generated between pairs of stations, according to the source and destination address. The group consists of the Matrix Control Table, the Matrix DS (destination to source) Table, and the Matrix SD (source to destination) Table. The matrix table determines the interface on which the information is gathered.

When the Ringswitch detects a new conversation, it creates a new entry in both the Matrix DS Table and the Matrix SD Table. The tables both contain the following statistics:

- Source address
- Destination address
- Source-Dest Packets
- Source-Dest Octets
- Source-Dest Errors

In accordance with RFC 1513, the error counters are never incremented for token-ring networks. The mode requirements are the same as those for the Host group shown in Table D.4.

---

**Filters (MIB object ID mib-2.16.7)**

The Filters group enables the user to define general conditions for the capture of network data packets.

**Packet Capture (MIB object ID mib-2.16.8)**

The Packet Capture group contains captured network packets which match the conditions in the Filters group. The information can be used to analyze individual network packets.

**Events (MIB object ID mib-2.16.9)**

The Events group controls the generation and notification of events from the Ringswitch RMON probe. The group consists of the Event Table and the Log Table.

Support for this group depends on the event that is tracked. The event is any one of the MIB variables provided by the RMON probe; refer to the other groups to determine the RMON mode requirements for specific MIB variables. To set an event, the event must exist within the RMON probe.

---

## RFC 1513 groups supported by RMON modes

RFC 1513 defines a Token Ring group (MIB object ID mib-2.16.10), which comprises of a series of specific token-ring tables.

The tables are:

- Ring Station Control Table
- Ring Station Table
- Ring Station Order Table
- Ring Station Config Control Table
- Ring Station Config Table
- Source Routing Statistics Table

### **Ring Station Control Table**

The Ring Station Control Table controls which interfaces the Ring Station Tables apply to, and collects data that provides a summary of the configuration of each ring.

The following statistics are collected:

- Table Size
- Active Stations
- Ring State
- Beacon Sender
- Beacon NAUN
- Active Monitor
- Order Changes

The Ring Station Control Table is fully supported by each of the RMON modes, and all counters are accurate.

---

## Ring Station Table

The Ring Station Table contains a list of entries associated with stations discovered on the local ring. The table is generated automatically when a Ring Station Control Table is enabled.

The following statistics are collected:

- Last NAUN
- Station Status
- Enter Time
- Exit Time
- Duplicate Addresses
- In and Out Line Errors
- Internal Errors
- In and Out Burst Errors
- AC Errors
- Abort Errors
- Lost Frame Errors
- Congestion Errors
- Frame Copied Errors
- Frequency Errors
- Token Errors
- In and Out Beacon Errors
- Insertions

---

Common frames counted in the Ring Station Table are shown in Table D.2.

*Table D.5      Frames commonly counted in the Ring Station Table*

Frame	Destination address
Ring Purge	Functional broadcast
Beacon	
Active Monitor Present (AMP)	
Standby Monitor Present (SMP)	
Claim Token	
NAUN Change	CRS
Report Error	REM
Duplicate Address Frame	Individual address

---

Support for the Ring Station Table provided by each mode is shown in Table D.4.

*Table D.6 Mode requirements of the Ring Station Table*

RMON mode	Support
All Frames	Fully supports the Ring Station Table. All counters provide accurate data
MAC Frames Only	All counters except for the ringStationDuplicateAddress counter are accurate. The only station resulting in a duplicate address count is the Ringswitch
All Frames to Address	All counters except for the ringStationDuplicateAddress counter are accurate. The ringStationDuplicateAddress is accurate for the Ringswitch and the specified snoop address if the station is local

### Ring Station Order Table

The Ring Station Order Table consists of a list of MAC addresses of stations in the ring poll, ordered by their ring order. This table is generated automatically once a Ring Station Control Table has been enabled. The group requires that AMP and SMP frames, which are both sent to the broadcast functional address, are processed by the Ringswitch.

The Ring Station Control Table is fully supported by each of the RMON modes, and all counters are accurate.

---

### **Ring Station Config Control Table**

The Ring Station Config Control Table allows active management of stations by the Ringswitch RMON probe. This enables the station to be removed via a Remove Station MAC frame, and the statistics for the station can be updated via Report Station Address and Report Station State MAC frames.

The Ring Station Config Control Table is generated automatically when a Ring Station Control Table is generated. Entries in this table correspond to entries in the Ring Station Table and are generated automatically as stations are discovered.

The Ring Station Config Control Table is fully supported by each of the RMON modes, and all counters are accurate.

### **Ring Station Config Table**

The Ring Station Config Table is generated after a successful UpdateStats write has been performed on the Ring Station Config Control Table.

The configuration information comprises:

- Location
- Microcode
- Group Address
- Functional Address

If the Ring Station Config Control table has been activated, full support is provided for the Ring Station Config Table by each of the RMON modes.

---

## Source Routing Statistics Table

The Source Routing Statistics Table is gathered from information in each token-ring packet. The information is valid only in a pure source-route bridging environment. In a transparent bridging or mixed bridging environment, the information may not be accurate.

The source-routing statistics apply to a single interface and use the ring number that is configured for the Ringswitch port. Make sure you configure a valid ring number for the Ringswitch port.



**Note:** If you change the ring number for the Ringswitch port, disable and re-enable the RMON probe to make the Source Routing Statistics Table use the new number.

---

The source-routing statistics are:

- Ring Number
- In and Out Frames
- Through Frames
- All Routes Broadcast Frames
- Single-Route Broadcast Frames
- In and Out Octets
- Through Octets
- All Routes Broadcast Octets
- Single Route Broadcast Octets
- Local LLC frames
- Frames with 1 hop, 2 hops, through 8 hops
- Frames with more than 8 hops

---

Support for the Source Routing Statistics Table provided by each mode is shown in Table D.4.

*Table D.7 Mode requirements of the Source Routing Statistics Table*

RMON mode	Support
All Frames	Fully supports the Source Routing Statistics Table. All counters provide accurate data in a pure source-route bridging environment
MAC Frames Only	Does not provide data for the Source Routing Statistics Table
All Frames to Address	Provides data for the specified snoop address only. Since the table contains Source Routing statistics, this means many of the statistics are inaccurate

## Enabling a mirror port

The Ringswitch MIB provides support for a mirror port, which allows LLC traffic to be copied from selected rings to a specified port that is connected to an external RMON probe or network analyzer. This enables the external monitor to log all traffic from multiple network segments, except MAC frames which continue to be processed by the internal probe.



**Note:** You can set up one mirror port per Ringswitch. When you set up a mirror port, make sure all forwarding modes are disabled on that port.

---

Using a mirror port reduces the processing demands placed on the Ringswitch. See TrueView online help for instructions to enable a mirror port.

## About virtual LANs

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The Ringswitch supports broadcast filtering and port-to-port blocking. This enables you to block or enable the forwarding of packets between specified ports on a Ringswitch, to include or exclude particular rings, by the configuration of logical workgroups, known as virtual LANs. Virtual LANs enable you to control the forwarding of broadcast frames on a network with distributed servers.



---

**Note:** You cannot configure virtual LANs by editing MIBs from an SNMP MIB browser.

---

By defining virtual LANs, you can:

- reduce the proportion of bandwidth occupied by broadcast traffic and the possibility of broadcast storms
- create a logical network structure that is independent of the actual physical layout, to make future moves and changes easier to support
- improve network security

The Ringswitch supports the configuration of virtual LANs that apply to source-routed frames, and a different kind of virtual LAN that applies to transparent-bridged frames.



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**Note:** The proprietary implementation of virtual LANs in the Ringswitch software may not be interoperable with other implementations of virtual LANs.

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## Source-routing virtual LANs

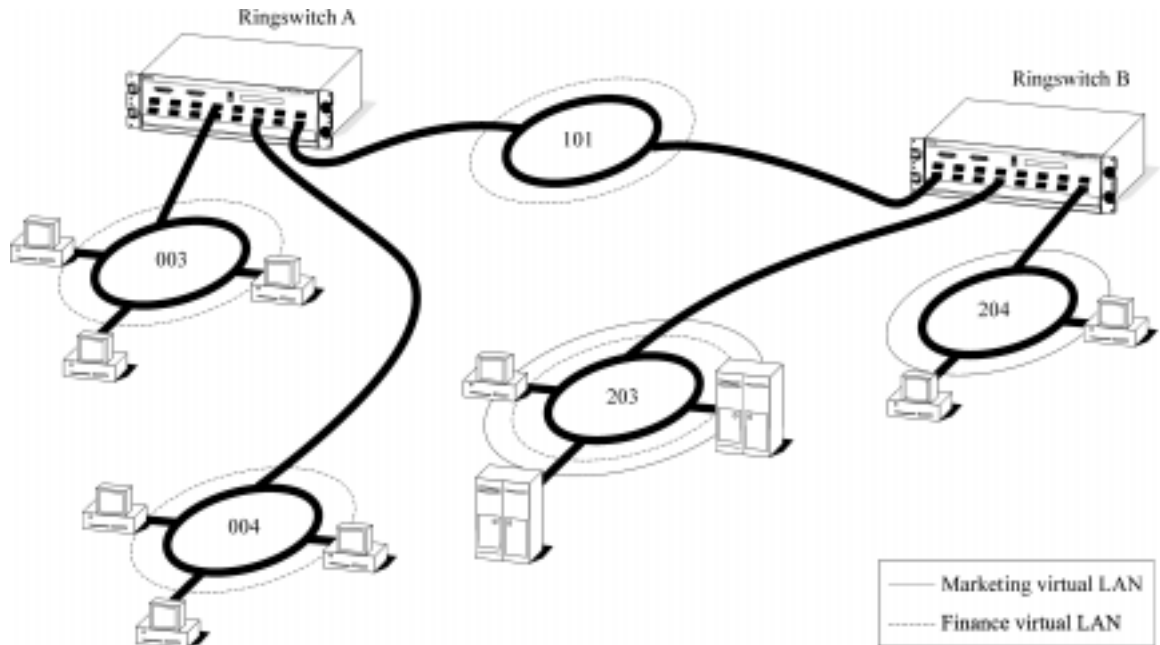
Source-routing virtual LANs are defined for the whole network, and can span one or more Ringswitch devices. A virtual LAN consists of two or more token-ring segments that are joined by Ringswitch devices, where stations can only make connections to other stations or servers that are part of the same virtual LAN. The result is that broadcast traffic originating on any ring is only received by stations on rings that belong to the same virtual LAN.

This means that service advertisement, address resolution, and route discovery packets that originate on a ring that does belong to a virtual LAN are not received by stations on rings that do not belong to the same virtual LAN.

### **Configuring source-routing virtual LANs**

You can define several overlapping virtual LANs that share common resources like file servers and print servers. In Figure E.1, the workgroup rings are divided into two virtual LANs that both include the centrally-located server ring 203. The Marketing virtual LAN includes rings 203 and 204, and the Finance virtual LAN includes rings 003, 004, 101, and 203. Although the virtual LANs share the ring on which the servers are located, broadcast frames are not forwarded from either virtual LAN onto rings that only belong to the other.

Figure E.1 Example of a source-routing virtual LAN



If the workgroups move to a new physical location, the administrator can redefine the virtual LAN to ensure that the workgroup can continue to access the ring to which the server is attached.

---

The Ringswitch supports the permeable and impermeable virtual LANs. Configure these using TrueView Ringswitch Manager.

- **Impermeable**  
You can define impermeable virtual LANs by specifying an explicit list of the ring numbers that belong to the virtual LAN. Define impermeable virtual LANs when one or more Ringswitch devices connect a number of rings to form a large LAN.
- **Permeable**  
You can define permeable virtual LANs by specifying a list of ring numbers. Permeable virtual LANs do not restrict the forwarding of broadcast traffic to an explicit list of the rings. Define permeable virtual LANs when Ringswitch devices are installed in a large source-routed network, to define logical workgroups without explicitly specifying the rings that belong to each virtual LAN.

### **Impermeable source-routing virtual LANs**

In an impermeable virtual LAN, forwarding decisions are based on the ring on which the frame originated, which is determined from the Routing Information Field (RIF) in each source-routed frame. This means that broadcast traffic is restricted to the explicit list of rings that belong to the virtual LAN.



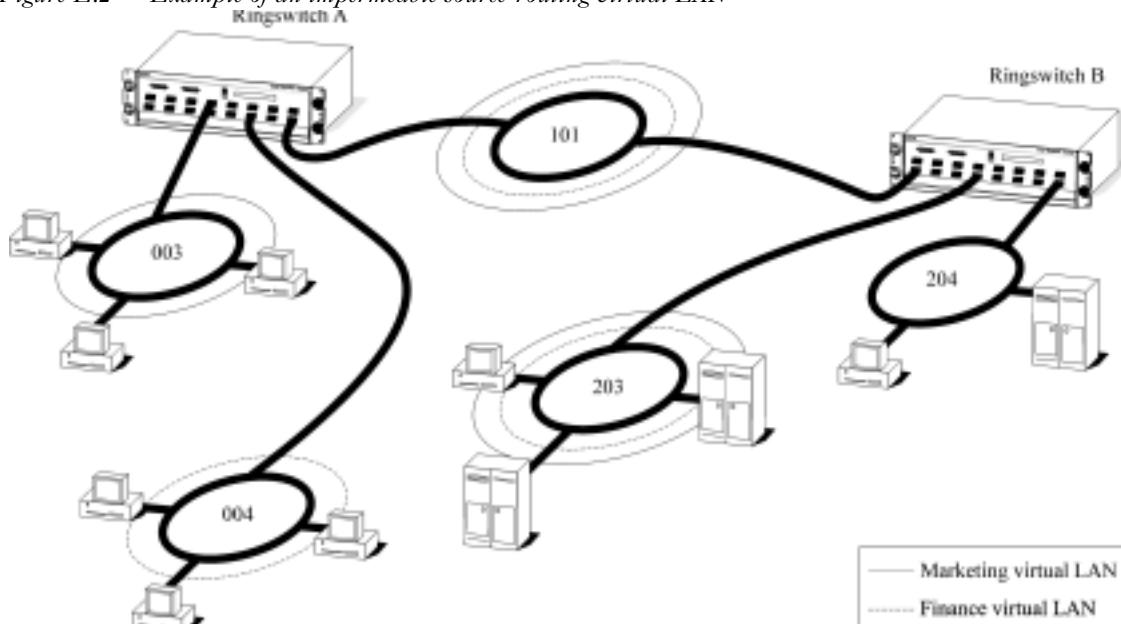
**Note:** Impermeable virtual LANs that span multiple Ringswitch devices must include a ring that connects the devices.

---

In Figure E.2, two impermeable virtual LANs both include a ring that has servers attached. The Marketing virtual LAN includes rings 003, 101, and 203, and the Finance virtual LAN includes rings 004, 101, and 203.

Broadcast frames are restricted to the list of rings that belong to the virtual LAN and are not forwarded from either virtual LAN onto rings that only belong to the other. For example, broadcast frames originating on ring 204 are not forwarded to rings that belong to either virtual LAN and the ring is treated as a third, generic virtual LAN.

*Figure E.2 Example of an impermeable source-routing virtual LAN*



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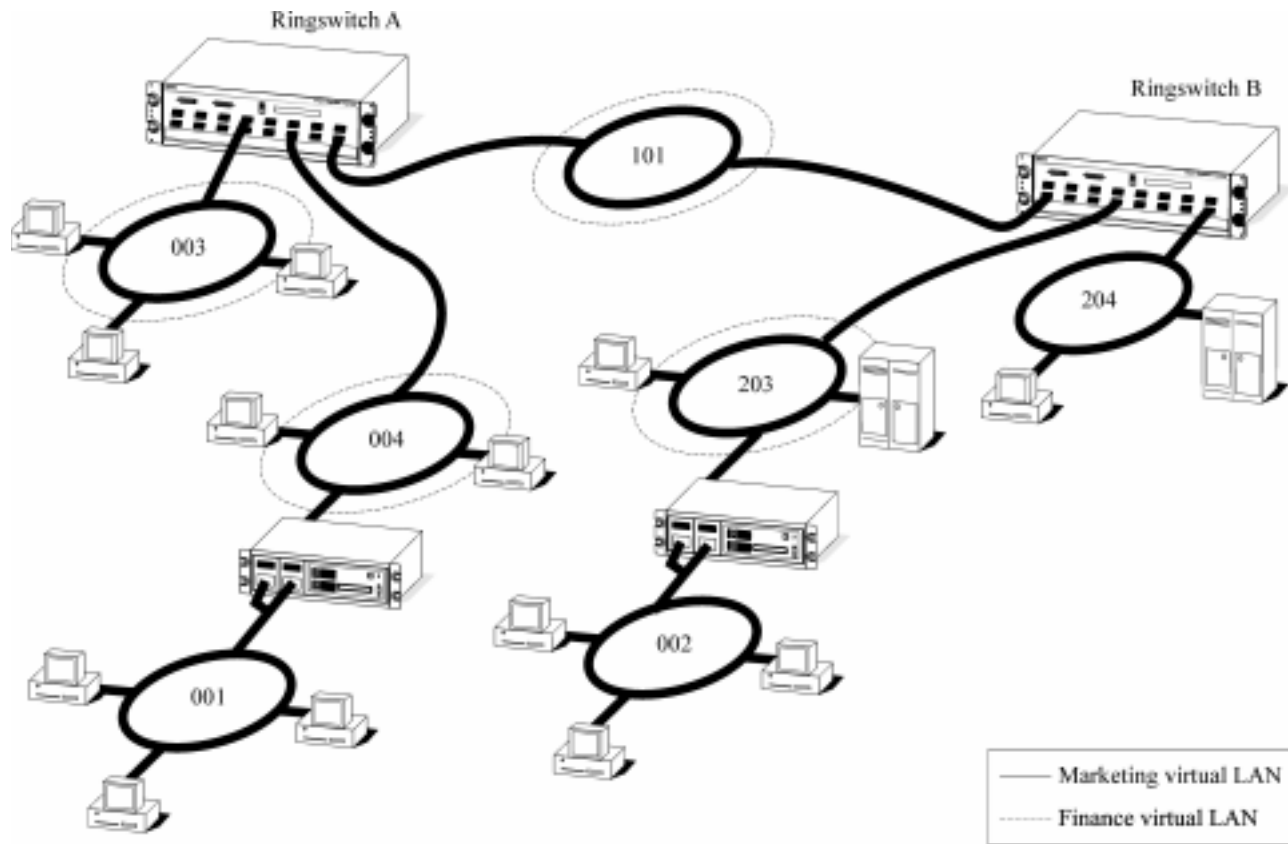
### **Permeable source-routing virtual LANs**

In a permeable virtual LAN, any ring that is connected directly to a ring that belongs to the virtual LAN can forward broadcast frames onto the virtual LAN, and receive broadcast frames from inside the virtual LAN.

In Figure E.3, a permeable virtual LAN includes rings 003, 004, 101, and 203. However, because the virtual LAN is permeable, rings 001 and 002 can forward broadcast frames onto the virtual LAN, and receive broadcast frames from inside the virtual LAN.

Ring 204 is not directly connected to a ring that is included in the virtual LAN. Therefore, the stations on the ring cannot forward broadcast frames onto the virtual LAN or receive broadcast frames from inside the virtual LAN.

Figure E.3 Example of a permeable source-routing virtual LAN



---

## Transparent virtual LANs

The Ringswitch supports up to 31 transparent virtual LANs, which are applied to all transparent-bridged frames. A virtual LAN consists of one or more token-ring ports on a single Ringswitch, where ports can only forward frames to other ports that are part of the same virtual LAN. The result is that traffic originating on any port is only received by ports that belong to the same virtual LAN.

The ports that do not belong to any virtual LAN are treated as a generic virtual LAN, and may forward frames to other ports that do not belong to any virtual LANs.



**Note:** Addresses in the transparent bridge static address table always override defined virtual LANs when forwarding to allowed ports.

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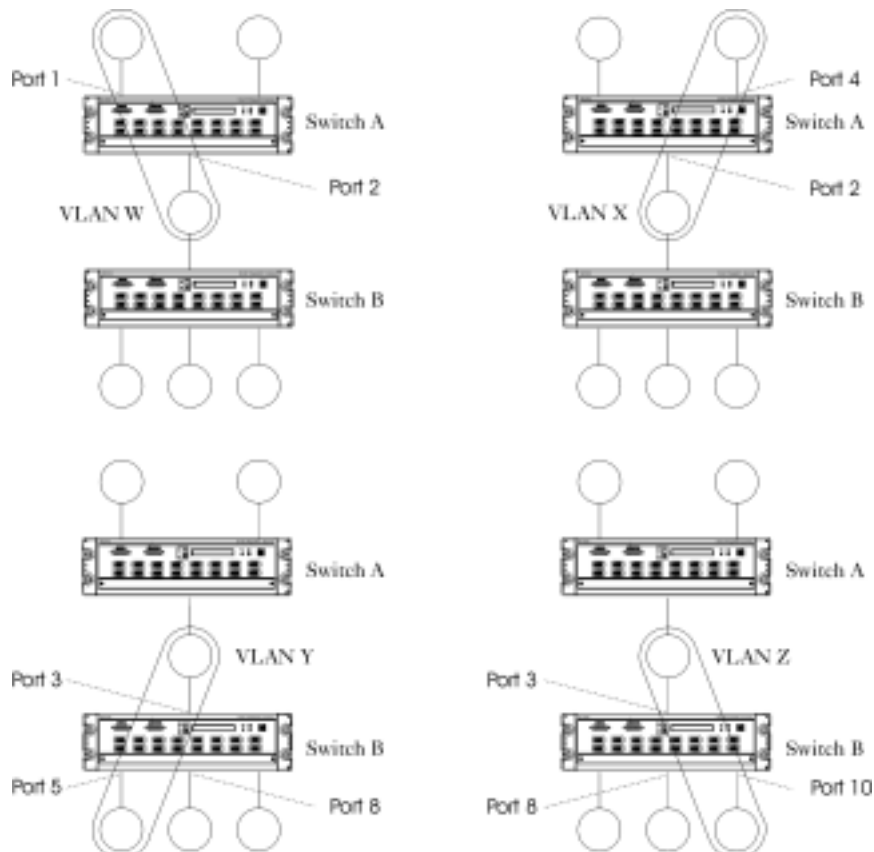
In Figure E.4, two transparent virtual LANs are configured on each of two Ringswitch devices. All transparently bridged traffic is restricted to the explicit list of ports that belong to each virtual LAN. This minimizes traffic on user rings.

*Table E.1      Transparent virtual LANs in Figure E.4*

Ringswitch name	Virtual LAN name	Ports in virtual LAN
Switch A	VLAN W	1, 2
	VLAN X	2, 4
Switch B	VLAN Y	3, 5
	VLAN Z	3, 10

Port 8 on Switch B is not included in any virtual LANs. Therefore, the stations connected to the port cannot forward transparently bridged frames onto the virtual LANs or receive transparently bridged frames from inside the virtual LANs.

*Figure E.4 Example of transparent virtual LANs W, X, Y, and Z*



# Token ring and Ethernet conversion

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This appendix gives an overview of how to integrate token ring and Ethernet. Translational Bridging is the method by which the Ringswitch converts between token ring and Ethernet. Within the Ringswitch, the Translational Bridging function is performed by the ATM Module or by the Smart Ringswitch 2-Port Ethernet Module.

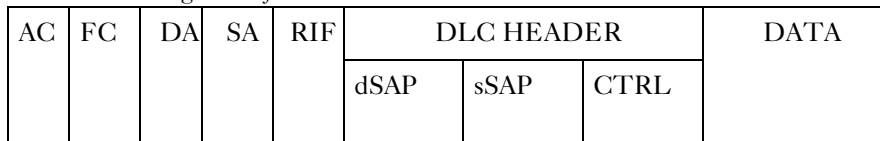
## Frame formats

Ethernet and token ring use different frame formats and different fields within these formats to carry information. There are four Ethernet frame formats: Ethernet-II, 802.2, 802.3 raw and SNAP. There are two token ring frame formats: 802.2 and SNAP. The higher level protocols then use these frame formats to communicate between devices using the same formats.

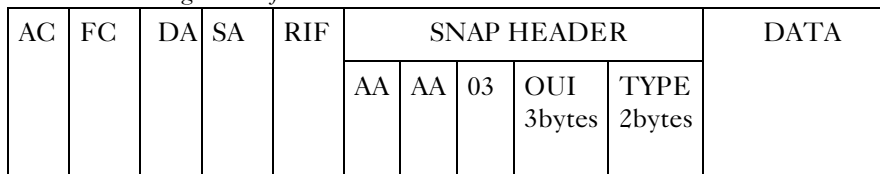
---

## Token ring frame formats

*Figure F.1 Token-ring 802.2 frame*



*Figure F.2 Token-ring SNAP frame*



---

A token-ring frame contains the following fields:

AC	The Access Control field (one byte) is used for priority reservation and identifying the frame as a token or data frame, and it indicates whether it has passed the Active Monitor on the ring.
FC	Frame Control (one byte) is used to distinguish a MAC frame from a data frame. The FC byte may include a data priority level.
DA and SA	Destination and Source Address are each six bytes long in non-canonical format. The first three bytes indicate the network vendor, and the last three are specified by the network vendor. The source is always a unicast (MAC) address; the destination may be a unicast, broadcast, or multicast (group or functional) address.
RIF	This field contains the optional source routing information which controls how the frame is bridged in an SR or SRT network.
HEADER	<p>In an 802.2 format frame the dSAP and sSAP values indicate the higher level protocol (for example, E0 for IPX and F0 for Netbios).</p> <p>In a SNAP format frame the OUI and TYPE fields indicate the higher level protocol. If the OUI field is all zeroes then the TYPE field is an Ethernet type value. For example, the type might be: 0800 for an IP frame, 0806 for an ARP frame, 8035 for a RARP frame, or 8137 for an IPX frame.</p>
DATA	Data area uses a maximum frame size of about 4k at 4Mbps and about 17k at 16Mbps or 100Mbps.

---

## Ethernet frame formats

*Figure F.3 Ethernet II frame*

DA	SA	TYPE	DATA	PAD
----	----	------	------	-----

*Figure F.4 802.2 frame*

DA	SA	LENGTH	DLC HEADER			DATA	PAD
			dSAP	sSAP	CTRL		

*Figure F.5 802.3 Raw IPX frame*

DA	SA	LENGTH	FF	FF	rest of IPX HEADER	DATA	PAD
----	----	--------	----	----	--------------------	------	-----

*Figure F.6 802.3 SNAP frame*

DA	SA	LENGTH	SNAP HEADER					DATA	PAD
			AA	AA	CTRL	OUI bytes	TYPE 2 bytes		

---

An Ethernet frame contains the following fields:

DA and SA	Destination and Source Addresses are each six bytes long and contain the MAC address of the destination and source devices in canonical format. The first three bytes indicate the network vendor; the last three bytes are specified by the network vendor. The source address is always a unicast (MAC) address. The destination address is either unicast, multicast (group), or broadcast (all nodes).
TYPE	The Type field is used in Ethernet II formatted frames. It specifies the upper-layer protocol that is to receive the data. Examples are: IP uses a value of 0800, ARP uses 0806, RARP uses 8035 and IPX 8137.
LENGTH	Length indicates the number of bytes of data that follow this field. It can be distinguished from a TYPE value because the length field is always less than 0600 (hex) and TYPE values are always greater.
HEADER	<p>In an 802.2 format frame the dSAP and sSAP values indicate the higher level protocol (for example, E0 for IPX and F0 for Netbios).</p> <p>In a SNAP format frame the OUI and TYPE fields indicate the higher level protocol. If the OUI field is all zeroes, then the TYPE field is an Ethertype value. For example, the type might be: 0800 for an IP frame, 0806 for an ARP frame, 8035 for an RARP frame, or 8137 for an IPX frame.</p> <p>802.3 raw IPX frames are a special case where the length field is immediately followed by an IPX header which starts with two bytes of FF to distinguish it from an 802.2 frame.</p>

---

DATA	The Data area fills the rest of an Ethernet frame. The maximum size of the entire frame must not be more than 1514 bytes.
PAD	The minimum size of an Ethernet frame is 60 bytes. If the headers and data are smaller than this then the Translational Bridge adds a Pad field to ensure the minimum frame size.

### Canonical and non-canonical MAC addresses

The MAC addresses in Ethernet and token-ring frames are stored in opposite bit-ordering. The format in Ethernet is called canonical and in token ring it is called non-canonical. Part of the translational bridging process involves converting between these two formats by bit-reversing each byte.

A MAC address consists of six bytes, each of which has two hex digits. To convert from canonical to non-canonical format (or vice versa) take each byte in turn, convert the two digits according to the table below and then swap them around.

For example: 00-80-5F-E4-15-3C becomes 00-01-FA-27-A8-3C using the table below.

*Table F.1 Table of fix up values*

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	8	4	C	2	A	6	E	1	9	5	D	3	B	7	F



---

**Note:** Some byte values such as 3C, 7E and EE remain the same after conversion between the two formats. By using six of the bytes that stay the same you can specify a Locally Administered Address (LAA) which is the same on Ethernet and token ring. LAAs like this are known as palindromic addresses. They can be useful for such devices as directly attached IPX printers which can otherwise cause problems in translationally bridged networks.

---

## Translational Bridging

To ensure that the correct frame formats for both token ring and Ethernet are transmitted by a Translational Bridge, the bridge itself must perform a number of conversions and alterations to the received frame. The exact changes necessary depend upon whether the frame is received from an Ethernet or a token-ring network, and on whether the token-ring network is using source routing.

### Frame conversion within the Translational Bridge

The Translational Bridge may do the following processes:

- 1 Add or remove the token ring AC and FC bytes.
- 2 Fix up (bit swap) the destination and source MAC addresses.
- 3 Add or remove the Ethernet type or 802.3 length field.
- 4 Remove or add the correct Routing Information Field (RIF).
- 5 Modify the frame encapsulation and do various frame type specific modifications.
- 6 Add or remove any necessary Ethernet padding.
- 7 Recalculate the CRC.

---

### **Protocol fixup capabilities**

Protocols such as IP and IPX store MAC addresses canonically in Ethernet frames and non-canonically in token-ring frames. To link Ethernet and token-ring networks the Translational Bridge must ‘fix up’ frames by reading the protocol and attempting to locate embedded MAC addresses within the protocol header or the data field. The Translational Bridge can then translate the bit order from canonical to non-canonical, or vice-versa, depending on the direction in which the frame is being bridged.

### **Source routing**

Ethernet, unlike token ring, does not support source route environments, and will not expect or resolve a Route Information Field (RIF). Any token-ring RIF field must be removed when forwarding frames to an Ethernet network. Madge products using Translational Bridging store the RIF within their cache and index against the corresponding source address of the originating device. Thus when frames are received from the Ethernet network, the Translational Bridge adds the correct RIF value into the frame before transmission onto the token-ring network.

---

## IP Translational Bridging

IP frames are always converted between Ethernet II format on Ethernet and SNAP format on token ring. IP is transparent to the network topology and therefore requires fewer alterations than IPX translation during bridging between Ethernet and token-ring domains.

As token-ring frames can support a larger MTU frame size than Ethernet, the Translational Bridge can use IP fragmentation to split up a token-ring frame into one or more Ethernet frames using the maximum of 1500 bytes that an Ethernet network can support. An IP frame has a single bit in its header which informs a device whether or not to fragment the frame. If a frame cannot be fragmented then the Translational Bridge sends an ICMP message back to the originator to tell it the maximum frame size it can use.

ARP, RARP, BOOTP and DHCP frames contain embedded MAC addresses within the frame. Therefore the Translational Bridge recognizes these frames and fixes up all the embedded MAC addresses.

---

## **IPX Translational Bridging**

In most networks IPX over token ring uses 802.2 format; it can also use SNAP format. Ethernet may use one of three formats: 802.2, 802.3, or Ethernet II. To use one of these formats on token ring and one on Ethernet, you must configure the Translational Bridge. It will then convert between these formats. Some IPX based protocols use MAC addresses embedded within the data field. This makes the task of conversion to the correct frame type extremely complex. In most NetWare Server applications the MAC addresses are held in the IPX header and allow Translational Bridges to correctly convert the frames type needed in one conversion between token-ring and Ethernet devices. Special 'fix ups' are needed for RIP and SAP frames, which contain many embedded MAC addresses.

### **IPX even-length frames**

Novell recommend that all datagrams transmitted on Ethernet using Raw 802.3 or Ethernet-II encapsulation be of even length. The Translational Bridge achieves this by placing a single padding byte into all odd-length IPX frames. The Translational Bridge removes the padding bytes when forwarding back to token ring.

## **Configuring BOOTP and DHCP**

The MAC addresses in BOOTP and DHCP frames are bit-swapped by the Translational Bridge. This means that, if a BOOTP or DHCP server is being configured with the MAC address of a workstation on the opposite side of the Translational Bridge, it must be entered in bit-swapped format.

## Using the command line interface

---

The Ringswitch supports serial management and Telnet sessions, and provides a simple command-line interface that you can use to configure the Ringswitch before connecting other network devices.

### To use the command line interface

Connect either a terminal that supports a fixed serial format of 9600 baud, 8 bits, 1 stop bit, and no parity to the serial port by means of a null-modem EIA/TIA-232 cable with a 25-pin D-type connector or a Hayes-compatible modem by means of a straight-through EIA/TIA-232 cable with a 25-pin D-type connector. When the Ringswitch is switched on, it puts the modem into auto-answer mode.



**Note:** EIA/TIA-232 and EIA/TIA-449 are equivalent to recommended standards RS-232 and RS-449 which have been since accepted as standards by the Electronics Industries Association (EIA) and Telecommunications Industry Association (TIA).

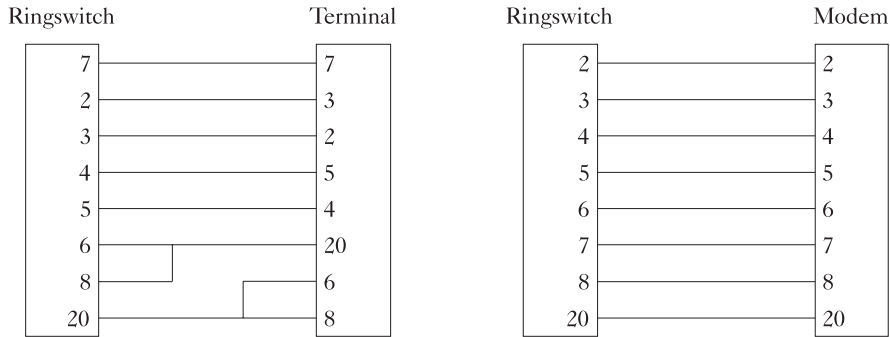
---

- 1 Start a Telnet session.
- 2 Type the password at the sign-on message. (This is the community string of the Ringswitch. You need to use a password if you want to write information to the device. If you do not supply a password you will only be able to use read-only commands.)
- 3 Type `help` and press Return.
- 4 You see the Ringswitch commands. (If you only have read-access you see a subset of commands.)
- 5 Type a command from the list and press Return.

**Serial port pinouts**

Figure G.1 illustrates the pin connections to use when you connect the Ringswitch to a terminal using a null-modem EIA/TIA-232 cable, or to a modem using a straight-through EIA/TIA-232 cable.

*Figure G.1 Pin connections for the serial port*



---

## Entering commands

When you connect to the serial interface using the Ringswitch password, or when no password is set, you can gain access to read commands such as `show bridge status` and write commands such as `set port ifmode`.

If you do not enter the correct password, you can only enter read commands and you cannot change the configuration of the Ringswitch. If you have read-only access to the device, the `help` command displays only those commands that are available to you.

Whether you have read-only or read/write access to the Ringswitch, you can enter commands by typing only the first part of the command and pressing the Space Bar or the Return key. Depending on the combination of command lines that can result from the part that you have entered, pressing the Space Bar completes the remaining part of the command line for you.

For example, to enter the command `show bridge characteristics`:

- 1 At the prompt, type `sh` and press the Space Bar.  
The word `show` is added to the command line.
- 2 Type `b` and press the Space Bar.  
The word `bridge` is added to the command line.
- 3 Type `ch` and press the Space Bar.  
The command line `show bridge characteristics` is complete.

Press the Return key to display all the possible commands based on the part that you have entered.

---

## General commands

Use the general commands described in Table G.1.

*Table G.1    General commands*

Command	Description
>help	Displays a list of the commands that you can use to manage the Ringswitch
>quit	Ends the serial management session

---

## Configuring the Ringswitch

When you set up the Ringswitch for the first time, set the name that identifies the device, and change the management password to restrict management access. Depending on the architecture of your network, you may need to assign an IP address to the device, or enable the RARP, BOOTP, or DHCP protocols that permit the Ringswitch to obtain its IP addresses from a server.

### Setting the Ringswitch name and management password

The Ringswitch name identifies the switch on the network, and enables you to identify switches easily in TrueView Ringswitch Manager. Use TrueView Ringswitch Manager to enter text strings to record other comments, such as the location of the Ringswitch, to facilitate maintenance and troubleshooting.

The `set bridge name` command sets the unique name that identifies the Ringswitch on the network.

Command:        `>set bridge name <name>`

Parameter:      `name`                      Ringswitch name (1-16 characters)

The Ringswitch password is implemented in the SNMP community string, and provides a simple means of restricting management access to the switch.



**Note:** For security reasons, always change the password from the default setting when you set up the switch for the first time.

---

---

The `set bridge password` command sets the password that you enter to manage the Ringswitch using the serial interface or TrueView Ringswitch Manager.

Command:        `>set bridge password <password>`

Parameter:       `password`               Ringswitch password (6-8 characters)

## Setting IP addresses

If you use the Internet Protocol (IP) on the network, define an IP address, subnet mask, and default gateway for the Ringswitch. If your network supports it, you can enable an address-resolution protocol that enables the Ringswitch to acquire an IP address, subnet mask, and IP gateway from a RARP, BOOTP, or DHCP server.

The `set bridge ip address` command sets the IP address of the Ringswitch to a fixed value.

Command:        `>set bridge ip address <ipaddress>`

Parameter:       `ipaddress`               IP address (aaa.bbb.ccc.ddd)

The `set bridge subnet` command sets the IP subnet mask.

Command:        `>set bridge subnet <ipaddress>`

Parameter:       `ipaddress`               IP subnet mask (aaa.bbb.ccc.ddd)

---

The `set bridge gateway` command sets the default gateway.

Command:        `>set bridge gateway <ipaddress>`

Parameter:      `ipaddress`            IP gateway (`aaa.bbb.ccc.ddd`)



---

**Note:** The `set bridge ip address` command overrides an IP address configured using RARP, BOOTP or DHCP. The subnet mask and gateway addresses will only be used if you have set the IP address of the Ringswitch. If the Ringswitch acquires its IP address from a RARP, BOOTP or DHCP server, then it will also acquire the subnet mask and gateway addresses from here.

---

---

## Enabling RARP, BOOTP, and DHCP

The Ringswitch supports the Reverse Address Resolution Protocol (RARP), Bootstrap Protocol (BOOTP), and Dynamic Host Configuration Protocol (DHCP), each of which provides an industry-standard way for the Ringswitch to acquire an IP address, subnet mask, and IP gateway from a server. The Ringswitch supports RARP as specified in RFC 903. Configure a RARP server with the MAC address of the Ringswitch port that will communicate with the server, and the IP address you want to allocate to the Ringswitch.

The `enable rarp` command enables RARP support.

Command:      `>enable rarp`

The `disable rarp` command disables RARP support.

Command:      `>disable rarp`

The Ringswitch supports BOOTP as specified in RFC 951. Configure a BOOTP server with the MAC address of the Ringswitch port that will communicate with the server, and the IP address you want to allocate to the Ringswitch.

---

The `enable bootp` command enables BOOTP support.

Command:      `>enable bootp`

The `disable bootp` command disables BOOTP support.

Command:      `>disable bootp`

The Ringswitch supports DHCP as specified in RFC 1541. DHCP is a variant of BOOTP, where IP stations lease IP addresses for a period of time determined by the DHCP server that is responsible for the addresses. Typically a station receives an IP address from a range of possible addresses. For reliable operation, make sure the Ringswitch uses a fixed entry and always acquires the same IP address from the DHCP server.

The `enable dhcp` command enables DHCP support.

Command:      `>enable dhcp`

The `disable dhcp` command disables DHCP support.

Command:      `>disable dhcp`

---

## Selecting the maximum frame size mode

The Ringswitch offers two maximum frame size modes, 4.5K and 18K, enabling you to choose the maximum frame size which best suits your network requirements. When you select to use 18K mode on a Ringswitch, it applies to all the modules in the Ringswitch (see below).



**Caution:** Changing the Ringswitch maximum frame size causes the Ringswitch to reboot.

---



**Note:** When the Ringswitch is in 18K mode all 4Mbps ports will be disabled. (The IEEE standard does not allow 4Mbps links to support frame sizes greater than 4.5K.) The Ringswitch LCD will display the message **Unsupported Ring Speed** for those 4Mbps ports that are enabled.

---



**Note:** Only ATM cards with code versions greater than or equal to 3.09.00 will operate in 18K mode. All other ATM cards with code versions less than this will be disabled. The Ringswitch LCD will display the message **No open**.

---



**Note:** The Smart Ringswitch FDDI Module only supports frame sizes of 4.5K. If you select to use 18K mode on a Ringswitch containing an FDDI Module, the FDDI Module will operate in 4.5K mode and all other modules will operate in 18K mode.

---

---

The enable 18k frames support command puts the Ringswitch into 18K maximum frame size mode.

Command:      >enable 18k frames support

The disable 18k frames support command puts the Ringswitch into 4.5K maximum frame size mode.

Command:      >disable 18k frames support

---

## Selecting the forwarding mode

The Ringswitch offers Source Routing, Transparent, Source-Route Transparent, and Source-Route Transparent Plus bridging techniques.

These bridging techniques enable you to select the mode that best matches the network environment. The forwarding mode is set as a global parameter for each Ringswitch.



**Note:** To support Transparent bridging, Source-Route Transparent bridging, or Source-Route Transparent Plus bridging, the Ringswitch must have a Switch 2 Module or Switch 3 Module installed. For information about finding out the type of Switch Module hardware, see “Identifying the type of Switch Module hardware” in Chapter 1, Introduction to the Smart Ringswitch Family.

---

When you install a Ringswitch into a network that supports only source routing, change the forwarding mode to source routing only. This ensures the Ringswitch uses the IBM Spanning Tree protocol.

The `set bridge forwarding` command sets the global forwarding mode for the Ringswitch.



**Caution:** Changing the forwarding mode may cause a Ringswitch with a Switch 2 Module installed to reboot. Ringswitches with Switch 3 Modules installed will not reboot when the mode is changed.

Command:	>set bridge forwarding <mode>		
Parameter:	mode	Forwarding mode	
	none	The Ringswitch does not forward frames between rings	
	srb	The Ringswitch uses Source-Route Bridging	
	tb	The Ringswitch uses Transparent Bridging	
	srt_normal	The Ringswitch uses Source-Route Transparent bridging	
	srt_plus	The Ringswitch uses Source-Route Transparent Plus bridging	

---

The `set bridge root priority` command sets the spanning-tree root priority, which determines the device that becomes the root bridge when the port Spanning Tree mode is set to auto. To increase the priority of the Ringswitch, and the probability that the Ringswitch will become the root bridge, set a lower priority number.

Command:        `>set bridge root priority <priority>`

Parameter:      `priority`            Bridge root priority (decimal number in the range 0-65535)

The `set bridge number` command sets the number that identifies the Ringswitch to other bridges and switches on the network. The number must be unique to the device.

Command:        `>set bridge number <number>`

Parameter:      `number`            Bridge number (hexadecimal number in the range 0 to F)

### **Configuring Active Broadcast Control and virtual LANs**

Active Broadcast Control (ABC) features enable you to reduce the amount of broadcast traffic on the LANs interconnected by the Ringswitch.

The Ringswitch supports seven filters that each perform filtering of a particular kind of broadcast frame. You can configure the ABC filters using TrueView Ringswitch Manager.

For more information about ABC, see Appendix B, Configuring Active Broadcast Control.

---

## Enabling or disabling Remote Monitoring (RMON)

Smart Ringswitch software release 2.0 and later include Remote Monitoring (RMON) agent software that supports all of the nine general groups of information specified in the RMON MIB, and can monitor information on multiple ports. You can enable monitoring by the Ringswitch, and by one or more ports, by using TrueView Ringswitch Manager.

To use the RMON agent, you must obtain a Smart Ringswitch RMON License (part number: 84-27) from Madge Networks.

For more information about RMON, see Appendix D, About Remote Monitoring (RMON).

## Deleting Protocol Filters

To delete Protocol Filters, use the `delete filters` command.

## Viewing information about the Ringswitch

To get information about the Ringswitch use the `show bridge all` command. Alternatively, display subsets of that information by using the `show bridge status`, `show bridge characteristics`, and `show bridge counters` commands.

The `show bridge all` command displays information about the name, bridge number, IP addresses, and Spanning Tree parameters configured for the Ringswitch. The command also displays version numbers for the hardware and software components, and information about the number of frames and bytes that the Ringswitch receives, transmits, and discards.

---

Show bridge status displays the Spanning Tree parameters of the Ringswitch, and the version numbers of Ringswitch hardware and software components. The show port status command shows the information for a specific port.

Command:	>show bridge status	
Example:	Spanning Tree Bridge ID:	00006F7A0803
	Spanning Tree Designated Root Priority:	32768
	Spanning Tree Designated Root:	00006F7A0803
	Software Version:	2.00.00
	Boot EPROM Version:	1.04.06
	System Self Test Version:	2.00.00
	Boot Flash Version:	2.01.00
	Switch Hardware Version:	3.01.22
	Switch Software Version:	1.03.29
	MAC Software Version:	2.09.00
	Chassis Version:	1.00.00
	CPU Card Hardware Version:	2.00.00
	TRN Port Card Version:	1.00.00
	TRN Port Card Version:	1.00.00

---

The `show bridge characteristics` command displays information about the name, bridge number, and IP addresses configured for the Ringswitch. The `show port characteristics` command shows the information for a specific port.

Command: `>show bridge characteristics`

Example:	Bridge Name:	Ringswitch A
	Bridge Number:	1
	IP Address:	0.0.0.0
	IP Subnet Mask:	0.0.0.0
	IP Gateway:	0.0.0.0
	Spanning Tree Root Priority:	32768

If an FDDI Module or ATM module is installed, the `show bridge characteristics` command also displays the version numbers of FDDI Module and ATM module components.

The `show bridge counters` command displays the number of frames and bytes that the Ringswitch receives, transmits, and discards. Use the `show port counters` command to show the information for a specific port.

Command: `>show bridge counters`

Example:	Total Frames Transmitted:	12,999
	Total Frames Received:	13,533
	Frames Per Second:	0
	Bytes Per Second:	80
	Input Broadcast Discards:	0
	Output Broadcast Discards:	0
	Switched Frame Discards:	0

---

## Showing the slot status

The `show slots status` command displays the status of all the modules in the Ringswitch chassis. There are four possible states, as shown in the following example:

```
Command:      >show slots status

Example:      Slot 1:Card in this slot is OK
              Slot 2:Can't open port in this slot
              Slot 3:Can't boot the card in this slot
              Slot 4:No card connected to this slot
              Slot 5:No card connected to this slot
              Slot 6:No card connected to this slot
```

If you attempt to enable an ATM or FDDI interface on a card that is reported as `Can't open port in this slot`, then the open will fail and the following alert will appear on the Ringswitch LCD:

```
Slot <n> FDDI/ATM
Rev xx.xx.xx (No Open)
```

This is because the module's microcode must be upgraded before the interface can be enabled. For further troubleshooting information, refer to Table I.2 on page 336.

If a card is reported as `Can't boot the card in this slot`, then it must be moved to one of the top three slots before new code can be downloaded to it.

---

## Configuring ports

When you have configured the Ringswitch, the next step is to enable the ports and set up the interface mode, ring number, ring speed, forwarding mode, and Spanning Tree parameters for each port.

### Identifying ports

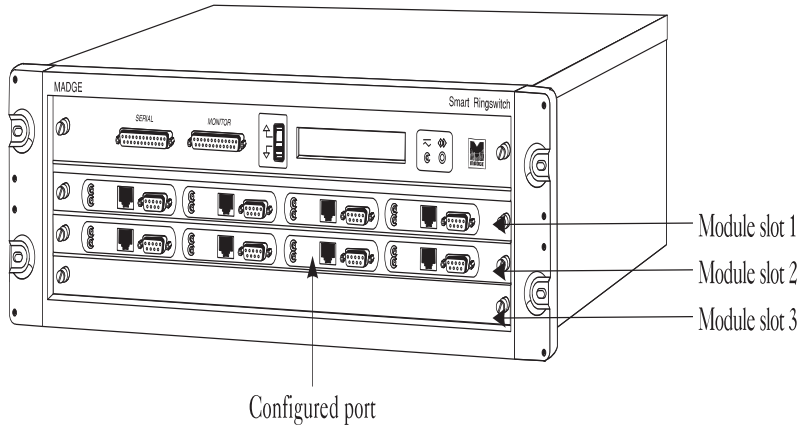
A bridging port is a channel which the Ringswitch forwards data to or from. A physical interface is the Ringswitch's logical connection to a particular physical network. There may be more than one bridge port per physical interface. For example, each ATM module consists of a single physical interface but may connect to a number of different emulated LANs, each of which will have its own bridging port on the switch.

The serial management interface refers to both bridging ports and physical interfaces using a two-level method. The first number represents the slot number of the module, and the second number represents the offset of the port or interface within this module.

On token-ring and FDDI modules, where there is only one bridge port per physical interface, the bridge port number for each port is the same as the physical interface number. For example, the command `enable interface 2:3` will enable port number three in slot two, as shown in the following diagram.

---

*Figure G.2 Identifying ports for use with the serial management interface.*



On ATM modules, the bridge port numbers correspond to a particular LAN Emulation Client (LEC) on that module. For more information, see Chapter 9, Configuring the Smart Ringswitch ATM Module.

On a Smart Ringswitch TLS Module, the bridge port numbers correspond to a particular leg port on that module. For more information, see Chapter 10, Configuring the Smart Ringswitch TLS Module.

---

## Enabling and disabling the interface

The enable interface command enables the physical interface.

Command:        >enable interface <slot:interface>

Parameter:      slot                      Slot number  
                  interface                Physical interface number

The disable interface command disables the physical interface.

Command:        >disable interface <slot:interface>

Parameter:      slot                      Slot number  
                  interface                Physical interface number

---

## Configuring the port interface mode

Use the port interface mode for each token-ring port on the Ringswitch to control how the port behaves, and determine the devices you can connect to the port.

For information about configuring the port interface mode according to the device you plan to connect to the Ringswitch:

- for copper token-ring ports, see Chapter 3, Connecting token-ring ports
- for high speed token-ring ports, see Chapter 5, Connecting high speed token-ring ports
- for fiber-optic token-ring ports, see Chapter 4, Connecting fiber token-ring ports

In Node mode, the port behaves like an adapter card and generates a phantom drive signal if it is a copper token-ring port, or IEEE 802.5j signalling keys if it is a fiber token-ring port, to insert into the connected device.

In Concentrator mode, the port behaves like a Lobe Attachment Module (LAM) port and detects the phantom drive signal if it is a copper token-ring port, or IEEE 802.5j signalling keys if it is a fiber token-ring port, that are generated when the connected device attempts to insert.

The Ringswitch also supports full-duplex, or Dedicated Token Ring (DTR), connections to Ringswitch devices and other hardware designed to meet draft specification IEEE 802.5r (draft 3). If you configure a full-duplex connection, the token-passing protocol is omitted and the connection operates as a serial link running at 16 Mbps in both directions at the same time, providing an aggregate bandwidth of 32 Mbps.

The port type determines whether the port operates in classic half-duplex or full-duplex mode, and whether the port operates in Node or Concentrator interface mode.



**Note:** In most conditions, configure the port type to be Automatic Node or Automatic Concentrator, depending on the device you connect to the port. The port will determine whether to use full-duplex mode by communicating with the connected device. If the port fails to resolve the port type in this way, force the port type to be classic or full-duplex.

The port interface modes are described in Table G.2.

*Table G.2     Interface modes for token-ring ports*

Interface mode	Description
Classic Node	The port behaves like an adapter card, in classic half-duplex mode, and inserts into the connected device
Classic Concentrator	The port behaves like a LAM port, in classic half-duplex mode, and detects when the connected device attempts to insert
Full Duplex Node	The port behaves like an adapter card and provides a full-duplex or DTR connection
Full Duplex Concentrator	The port behaves like a LAM port and provides a full-duplex or DTR connection
Automatic Node	The port behaves like an adapter card and determines whether to operate in classic or full-duplex mode by communicating with the connected device

---

*Table G.2      Interface modes for token-ring ports*

Interface mode	Description
Automatic Concentrator	The port behaves like a LAM port and determines whether to operate in classic or full-duplex mode by communicating with the connected device
CAU RI/RO	The CAU RI/RO port interface mode only applies to fiber token-ring ports. In CAU RI/RO interface mode, the port behaves like the Ring-In (RI) or Ring-Out (RO) port on a Controlled Access Unit (CAU). For example, it enables you to connect to the RI or RO port of a Madge Smart CAU Plus which has a Fiber Trunk Link (Smart CAU FTL) Module installed



**Note:** If you have a GroupSwitch you can only use Automatic concentrator (conc), Classic half-duplex concentrator (classic-conc), and Full-duplex concentrator (dtr-conc) port interface modes. If you use the GroupSwitch as a 5-port hub use classic-conc. When you set the port interface mode, the port closes and re-opens.



**Note:** If you have an HSTR Module, you must set it to either Full-duplex node or Full-duplex concentrator mode.

---

The `set port ifmode` command sets the port interface mode for a port.

Command:	>set port ifmode <slot:port> <mode>		
Parameter:	slot	Slot number	
	port	Port number	
	mode	Port interface mode:	
	node	Automatic node	
	conc	Automatic concentrator	
	classic-node	Classic half-duplex node	
	classic-conc	Classic half-duplex concentrator	
	dtr-node	Full-duplex node	
	dtr-conc	Full-duplex concentrator	
	cau-rio	CAU RI/RO (fiber token ring ports only)	

---

## Setting the ring speed

The `set port ifspeed` command sets the ring speed for the port to 4 or 16 Mbps or 100Mbps for HSTR modules. This only applies to token-ring ports.

Command:	>set port ifspeed <slot:port> <speed>	
Parameter:	slot	Slot number
	port	Port number
	speed	Ring speed (4 or 16 Mbps, or 100Mbps for HSTR modules)



**Note:** When you set the ring speed, the port closes and re-opens.

---



**Note:** For HSTR modules, this command is only included for completeness. The HSTR ports run at 100Mbps.

---

---

## Setting the ring number

The set port segment command sets the ring number of the segment connected to the port. Do not set the same ring number for multiple ports, unless you are using Source-Route Transparent Plus bridging (see Appendix A, “Network design issues”). It is not possible to set the ring number for ATM ports as they obtain the ring number automatically from the LECS.

Command: >set port segment <slot:port> <segment>

Parameter: slot Slot number

port Port number

segment Ring number (001-FFF hexadecimal)

---

## Configuring port forwarding

The set port forwarding command sets the forwarding mode for the port.

Command:        >set port forwarding <slot:port> <mode>

Parameter:      slot            Slot number

                 port            Port number

                 mode           Forwarding mode

                 none          The port does not forward frames

                 srb            The port forwards frames using source-route  
                 bridging

                 tb             The port forwards frames using transparent  
                 bridging

                 srt            The port forwards frames using source-route  
                 transparent bridging



**Caution:** If a given port is part of a Source-Route Transparent Plus shared ring, always set the port mode to source-route transparent.

---

---

The `set port tb force` command configures a port to forward Transparent frames at all times. Since the port does not participate in the Spanning Tree Protocol, exercise caution when configuring a switch to use the Force Transparent option because there is no protection against forwarding loops.

Command: `>set port tb force <slot:port> <enable/disable>`

Parameter: `slot` Slot number

`port` Port number

The `set port master` command causes the slave port to take its Spanning Tree State from that of the master port.

Command: `>set port master<slave_slot:slave_port> <master_slot:master_port>`

Parameter: `slave_slot` Slot number of the slave port

`slave_port` Port number of the slave port

`master_slot` Slot number of the master port

`master_port` Port number of the master port

Example `set port master 3:1 2:4`

---

The clear port master command resets the set port master command so that the port uses its own Spanning Tree State as per normal operation.

Command:        >clear port master <slot:port>

Parameter:       slot                    Slot number

                  port                    Port number

The set port hop count command sets the port hop count, which is the total number of hops that an All Routes Explorer (ARE) broadcast frame can make.

Command:        >set port hop count <slot:port> <hopcount>

Parameter:       slot                    Slot number

                  port                    Port number

                  hopcount            Port hop count (1-13)

---

The `set port spanning tree mode` command sets the port Spanning Tree Explorer Forwarding mode to auto, disabled, or forced. The mode determines whether the Ringswitch forwards Spanning Tree Explorer (STE) frames.

Command:	>set port spanning tree mode <slot:port> <auto   disabled   forced>	
Parameter:	slot	Slot number
	port	Port number
	auto	The Ringswitch determines whether to forward STE frames by communicating with source-route bridges on the network using the spanning tree protocol
	disabled	The Ringswitch does not forward STE frames
	forced	The Ringswitch always forwards STE frames between segments

---

The `set port path cost` command sets the port spanning-tree path cost. The port path cost enables the Spanning Tree protocol to determine the most efficient path between segments. This path will be used when forwarding transparent bridged frames, or when forwarding spanning tree explorers when the spanning tree explorer forwarding mode is set to auto.

Command:	>set port path cost <slot:port> <pathcost>	
Parameter:	slot	Slot number
	port	Port number
	pathcost	Port path cost (1-65535)

The `set bridge hop limit` command sets the maximum hop count that any frame forwarded by the bridge can have.

Command:	>set bridge hop limit <hop_count>	
Parameter:	<hop_count>	Port hop count (1-13)

Unlike the `set port hop count` command, this limit applies to spanning tree explorers and unicast frames as well as All Routes Explorer frames. Note that if a global hop limit is set to a lower value than that configured on any of the individual ports, then the port hop counts will be reset to match the global value. If the global limit is subsequently increased then the port limits will remain at the lower value.

---

## Configuring the Smart Ringswitch 8-Port TR Copper Module

The commands in Table G.3 only apply to the Smart Ringswitch 8-Port TR Copper Module which has part number: 157-930-xx and metal carrier ID: TRP 123. (In these commands, slot is the slot number and port is the port number.)

*Table G.3      Configuring the Smart Ringswitch 8-Port TR Copper Module*

Command	Description
>enable interface alternate priority <slot:port>	Use alternative token priority handling mechanism
>disable interface alternate priority <slot:port>	Use normal token priority handling mechanism
>show interface alternate priority <slot:port>	Show which token priority handling mechanism is in use. If enabled, the switch port uses a different token priority handling mechanism. Some other token-ring devices do not interoperate with the Ringswitch when lowering the token priority. This alternative method fixes the incompatibility
>enable interface frame status setting <slot:port>	Set the frame status bits of transparently forwarded frames
>disable interface frame status setting <slot:port>	Do not alter the frame status bits of transparently forwarded frames

---

*Table G.3     Configuring the Smart Ringswitch 8-Port TR Copper Module*

Command	Description
<code>&gt;show interface frame status setting &lt;slot:port&gt;</code>	Show how the frame status bits are dealt with for transparent frames. Certain applications expect the Frame Status Address Recognized and Frame Copied bits to be set on transparently forwarded frames. This can be enabled by this command but it only applies to TRP123 cards

---

### Configuring the token-ring port error timer

The set port softerr timer command sets the value of the Soft Error Report Timer Value that the Ringswitch token-ring port provides to other stations when it is configured to act as a Ring Parameter Server (RPS). It provides this value in the Initialize Ring Station MAC frame that it sends to other stations when they request this information, usually when they open onto the ring. The stations use this value to pace the transmission of MAC soft error report frames.

Command:	>set port softerr timer <slot:port> <timer_value>	
Parameter:	slot	Slot number
	port	Port number
	timer_value	Timer value (specified in milliseconds). The range must be between 10 and 655360 milliseconds in multiples of 10 milliseconds

---

## Configuring Fast Failover on an HSTR module

The `enable interface fmode` command enables Fast Failover on any odd-numbered port. The Ringswitch pairs that port with its right-hand neighbor to create the Fast Failover link. The new combined link adopts the characteristics and settings of the left-hand port. The right-hand port will be disabled, if it is not already. You must manage the link through the left-hand port. To change the characteristics of the Fast Failover link, you must configure the left-hand port.



---

**Note:** You can change the characteristics of the right-hand port in a Fast Failover link and it will not affect the characteristics of the Fast Failover link. The port will not use these characteristics until you disable the Fast Failover link using the `disable interface fmode` command.

---

You can enable Fast Failover on any number of HSTR ports on a Ringswitch. For more information about Fast Failover, see Chapter 5, Connecting high speed token-ring ports.

Command:        `>enable interface fmode<slot>:<port>`

Parameter:      slot                      Slot number

                 port                      Port number

The `disable interface fmode` command disables Fast Failover on a port.

Command:        `>disable interface fmode<slot>:<port>`

Parameter:      slot                      Slot number

                 port                      Port number

---

The `show interface fmode` command will display the status of the Fast Failover link.

Command:      `>show interface fmode<slot>:<port>`

Parameter:    slot                      Slot number

                 port                    Port number

---

## Configuring FDDI protocol fixups

If you have an FDDI Module installed, the `enable port fixups` command enables protocol fixups. When protocol fixups are enabled, the Ringswitch configures IP and IPX frames by reading the protocol and converting the bit order of embedded MAC addresses from canonical to non-canonical, or vice-versa, depending on the direction in which the frame is being bridged. For more information about protocol fixups, see “IP and IPX protocol fixup capabilities” in Chapter 8, “Configuring the Smart Ringswitch FDDI Module”.

Command:	>enable port fixups <slot:port>	
Parameter:	slot	Slot number
	port	Port number

If you attempt to enable protocol fixups for a token-ring port, you will see an error message. When an FDDI Module is installed, the `disable port fixups` command disables protocol fixups.

Command:	>disable port fixups <slot:port>	
Parameter:	slot	Slot number
	port	Port number

---

## Configuring the Smart Ringswitch ATM Module

If you have an ATM module installed, you can use additional commands to allow limited configuration of the card. For more information about ATM and the components of LAN Emulation (LANE), see Chapter 9, Configuring the Smart Ringswitch ATM Module.

Token ring and ATM use different addressing schemes and frame formats. Therefore, the LAN Emulation Client (LEC) that resides in the ATM Module provides a mechanism that resolves MAC-to-ATM addresses or ring number-to-ATM addresses to create Switched Virtual Circuits (SVCs) between the source and destination. It also performs the required SAR (Segmentation and Reassembly) function to convert the 4.5Kbyte token-ring frames into ATM 53-byte cells and vice versa.

### Setting the NSAP

The `set card atm lecs` command configures the ATM address of the LAN Emulation Configuration Server (LECS) for a particular card:

Command:	>set card atm lecs <slot> <NSAP>	
Parameter:	slot	Slot number
Parameter:	NSAP	NSAP (ATM) address
	default	Selects the default access point
Example	set card atm lecs 3 39840F8001BC61DF0007C0ED0000006FC280000	

For more information on ATM addressing, refer to the TrueView online help.



**Note:** In most cases, you do not need to specify the ATM address since the ATM Module will automatically locate the LECS.

---

### Setting ATM UNI signalling version

The `set card atm uni` command sets the ATM User-to-Network Interface (UNI) signalling version of a particular card.

Command:	>set card atm uni <slot> <3.0/3.1/auto>	
Parameter:	slot	Slot number
Parameter:	3.0	Selects UNI 3.0 signalling
	3.1	Selects UNI 3.1 signalling
	auto	Automatically selects the UNI signalling

The new version will only take effect when the ATM physical interface is next brought up. This means if the ATM physical interface is enabled, it must be disabled (for 15 seconds) and then re-enabled for the new signalling version to take effect. This can be done using the `enable interface` and `disable interface` commands (see Enabling a particular ATM module's physical interface, later in this chapter), or by resetting the Ringswitch.

---

### Setting the physical framing mode

The set card atm mode command sets the physical framing mode of a particular card.

Command:	>set card atm mode <slot> <sonet/sdh>	
Parameter:	slot	Slot number
Parameter:	sonet	Selects SONET (Synchronous Optical Network) framing mode
	sdh	Selects SDH (Synchronous Digital Hierarchy) framing mode

### Associating LEC with ELANs

The set port atm elan command associates a specified LAN Emulation Client (LEC) with a specified ELAN:

Command:	>set port atm elan <slot:port> <elan_name>	
Parameter:	slot	Slot number
	port	Port number
Parameter	elan_name	The name of the Emulated LAN. The ELAN name can be up to 32 alphanumeric characters. This parameter is case sensitive

---

### Enabling a particular LEC

The enable port lec command enables an individual LEC:

Command:	>enable port lec <slot:port>	
Parameter:	slot	Slot number
	port	Port number

### Disabling a particular LEC

The disable port lec command disables an individual LEC:

Command:	>disable port lec <slot:port>	
Parameter:	slot	Slot number
	port	Port number

### Enabling a particular ATM module's physical interface

The enable interface command enables the specified ATM card's physical interface:

Command:	>enable interface <slot:interface>	
Parameter:	slot	Slot number
	interface	Physical interface number

---

### Disabling a particular ATM module's physical interface

The disable interface command disables the specified ATM module's physical interface.

Command:	>disable interface <slot:interface>	
Parameter:	slot	Slot number
	interface	Physical interface number



**Note:** The ATM Module only has one physical interface, so the interface parameter will always be '1'.

---

### Creating LECs

The create port lec creates a LEC on the ATM port module.

Command:	>create port lec <slot:port>	
Parameter:	slot	Slot number
	port	The LECs offset in the card

---

## Deleting LECs

The `delete port lec` deletes a LEC from the ATM port module.

Command:        `>delete port lec <slot:port>`

Parameter:      `slot`                      Slot number

`port`                      The LECs offset in the card

Destroying a LEC and then creating one in the same `<slot:port>` destroys the old configuration, and the ELAN name is reset to default.

## Command line

The `show card atm interface` command displays the physical layer status.

Command: >show card atm interface <slot>

Parameter:	slot	Slot number
------------	------	-------------

```

Example:      Interface A:      Enabled
              Interface B:      Enabled
              Active Interface:   B
              Sonnet/SDH status:  Up
              ATM Status:         Up
              ILMI. Status:       Up
              Signalling Status:   Up
              Card NSAP:          Up
              LECS NSAP:          39840F8001BC61DF0007C0ED0000006FC280000
              Media Type:         0000000000000000000000000000000000000000
              Physical Mode:       Multi-Mode-Fiber
              Configured Signalling Version  Sonet
              Actual Signalling Version      Auto
              Switch Signalling Version      UNI3.1
              AAL5 Tx Discards:             0
              AAL5 Rx Discards:             1,134

```

---

## Configuring the Smart Ringswitch TLS Module

If you have a Smart Ringswitch TLS Module installed, you can use additional commands to configure of the card.

### Creating and deleting a Smart Ringswitch TLS Module leg port

The create port leg command creates a new leg port on a Smart Ringswitch TLS Module.

Command:        >create port leg <slot:port> name<name>

Parameter:	slot	Slot number
	port	Leg port number
	name	Name for leg port

The delete port leg command deletes an existing leg port from a Smart Ringswitch TLS Module.

Command:        >delete port leg <slot:port>

Parameter:	slot	Slot number
	port	Leg port number

---

### Configuring a Smart Ringswitch TLS Module leg port

After creating a leg port, you must configure it before you can enable it. Use the following commands to configure the leg port.



**Note:** If you execute the following two commands on an enabled leg port, you must disable the port and then re-enable it for the new values to take effect.

---

Command:	>set port leg <slot:port> IP address <ip address>	
Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of leg port in dot notation (for example: 192.168.16.1)
Command:	>set port leg <slot:port> IP subnet mask <subnet mask>	
Parameter:	slot	Slot number
	port	Leg port number
	subnet mask	Subnet mask for the IP subnet to which the leg port is connected in dot notation (for example: 255.255.255.0)



**Note:** If you execute any of the following commands, the new configuration takes immediate effect.

---

Command: >set port leg <slot:port> IP MTU <mtu size>

Parameter:	slot	Slot number
	port	Leg port number
	mtu size	Size of IP MTU supported by the leg port. This measures the maximum LLC header, IP header, and IP data payload size

Command: >set port leg <slot:port> IP multicast over <bcst,mcst,func>

Parameter:	slot	Slot number
	port	Leg port number
	bcst	Send IP multicast control traffic over broadcast MAC address (FF:FF:FF:FF:FF:FF)
	func	Send IP multicast control traffic over IP functional MAC address (C0:00:00:04:00:00)
	mcst	Send IP multicast control traffic over IP multicast MAC address, as specified in RFC1112

---

## Managing the IP subnet port group

Before a leg port can start routing on an IP subnet, you must configure the group of Ringswitch ports that belong to the IP subnet.

The add port leg subnet group port command adds a Ringswitch port to the IP subnet group of a leg port.

Command:	>add port leg <slot:port> subnet group port <p_slot:p_port>	
Parameter:	slot	Slot number of Smart Ringswitch TLS Module
	port	Leg port number
	p_slot	Slot number of physical port
	p_port	Physical port number

The remove port leg subnet group port command removes a Ringswitch port from the IP subnet group of a leg port.

Command:	>remove port leg <slot:port> subnet group port <p_slot:p_port>	
Parameter:	slot	Slot number of Smart Ringswitch TLS Module
	port	Leg port number
	p_slot	Slot number of physical port
	p_port	Physical port number

---

### Enabling and disabling a leg port

The enable port leg command enables an individual leg port.

Command:        >enable port leg <slot:port>

Parameter:	slot	Slot number
	port	Leg port number

The disable port leg command disables an individual leg port.

Command:        >disable port leg <slot:port>

Parameter:	slot	Slot number
	port	Leg port number

---

### Configuring RIP on a leg port

By default, when you create a leg port, RIP is disabled. The following commands configure and manage the various aspects of RIPv1 and RIPv2 operation.



**Note:** If you execute any of the following RIP configuration commands, the new configuration takes immediate effect.

---

The `set port leg RIP receive type` command selects the action a leg port performs when it receives a RIP packet.

Command:	>set port leg <slot:port> RIP receive type<donotreceive,rip1,rip2,rip1orrip2>	
Parameter:	slot	Slot number
	port	Leg port number
	donotreceive	Do not process any received RIP frames on this leg port
	rip1	Only process received RIPv1 frames on this leg port
	rip2	Only process received RIPv2 frames on this leg port
	rip1orrip2	Process received RIPv1 and RIPv2 frames on this leg port

---

The set port leg RIP send type command selects the type of RIP packet a leg port sends when RIP operation requests it.

Command:	>set port leg <slot:port> RIP send type<donotsend,rip1,rip1compatible,rip2>	
Parameter:	slot	Slot number
	port	Leg port number
	donotsend	Do not send RIP frames on this leg port
	rip1	Send RIPv1 frames on this leg port
	rip1compatible	Send RIPv2 frames using broadcast MAC address
	rip2	Send RIPv2 frames using multicast MAC address

---

The `set port leg RIP flags` and `clear port leg RIP flags` commands control the operation of the RIP protocol on a leg port. In these commands, enter the flags as a comma separated list.

Command:	>set port leg <slot:port>RIP flags <ad,ah,as,ld,lh,pr,rh,rs,sh>	
Parameter:	slot	Slot number
	port	Leg port number
	ad	Announce default routes
	ah	Announce host routes
	as	Announce static routes
	ld	Learn default routes
	lh	Learn host routes
	pr	Enable poison reverse algorithm
	rh	Enable route holddown
	rs	Enable route summarizing
	sh	Enable split horizon algorithm

---

Command: >clear port leg <slot:port>RIP flags <ad,ah,as,ld,lh,pr,rh,rs,sh>

Parameter:	slot	Slot number
	port	Leg port number
	ad	Do not announce default routes
	ah	Do not announce host routes
	as	Do not announce static routes
	ld	Do not learn default routes
	lh	Do not learn host routes
	pr	Disable poison reverse algorithm
	rh	Disable route holddown
	rs	Disable route summarizing
	sh	Disable split horizon algorithm

---

The set port leg RIPv2 authentication command sets the RIPv2 authentication type for a leg port.

Command:	>set port leg <slot:port> RIPv2 authentication <simple, md5>password<password>	
Parameter:	slot	Slot number
	port	Leg port number
	simple	Enable simple RIPv2 authentication using <password> as password
	md5	Enable MD5 RIPv2 authentication using <password> as digest key

The clear port leg RIPv2 authentication command clears any active RIPv2 authentication.

Command:	>clear port leg <slot:port> RIPv2 authentication	
Parameter:	slot	Slot number
	port	Leg port number

---

The add port leg RIP advertise and remove port leg RIP advertise commands control the list of IP addresses which may be advertised in RIP packets sent by a leg port.

Command: >add port leg <slot:port> RIP advertise <ip address>

Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of route to add to advertise route list

Command: >remove port leg <slot:port> RIP advertise <ip address>

Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of route to remove from advertise route list

---

The add port leg RIP reject and remove port leg RIP reject commands control the list of IP addresses which are ignored in RIP packets received by a leg port.

Command: >add port leg <slot:port> RIP reject <ip address>

Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of route to add to reject route list

Command: >remove port leg <slot:port> RIP reject <ip address>

Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of route to remove from reject route list

---

### Configuring OSPF on a leg port

By default, when you create a leg port, OSPF is disabled. The following commands configure and manage the various aspects of OSPF. The OSPF areas referred to in the commands are managed via other Smart Ringswitch TLS Module commands.



---

**Note:** These commands store the state of the OSPF protocol, but will not take effect until you reboot the Ringswitch.

---

The `set port leg OSPF area id` command sets the OSPF area id to which a leg port is connected.

Command:	>set port leg <slot:port> OSPF area id <area id>	
Parameter:	slot	Slot number
	port	Leg port number
	area id	OSPF area in dot notation

The `clear port leg OSPF area id` command clears the OSPF area id from a leg port, and disables OSPF on the leg port.

Command:	>clear port leg <slot:port> OSPF area id	
Parameter:	slot	Slot number
	port	Leg port number

---

The set port leg OSPF cost command sets the cost of sending a packet from this interface.

Command: >set port leg <slot>:<port> OSPF cost <number>

Parameter:	slot	Slot number
	port	Leg port number
	number	OSPF cost

The set port leg OSPF priority command sets the priority of this interface to become the designated router.

Command: >set port leg <slot>:<port> OSPF priority <number>

Parameter:	slot	Slot number
	port	Leg port number
	number	OSPF priority

---

The set port leg OSPF interval hello dead command sets the OSPF intervals in seconds.

Command: >set port leg <slot>:<port> OSPF interval hello <number> dead <number>

Parameter:	slot	Slot number
	port	Leg port number
	number	OSPF hello interval in seconds
	number	OSPF dead interval in seconds

---

### Configuring BOOTP Relay on a leg port

The add card tls BOOTPRA server command adds a BootP Relay Agent server to a leg port.

Command	>add card tls <slot>BOOTPRA server <ip address>		
Parameter:	slot	Slot number	
	ip address	IP address of the BOOTP Relay Agent server	

The enable port leg command enables BootP Relay Agent server on a leg port.

Command	>enable port leg <slot>:<port>BOOTPRA		
Parameter:	slot	Slot number	
	port	Leg port number	

The disable port leg command disables BootP Relay Agent server on a leg port.

Command	>disable port leg <slot>:<port>BOOTPRA		
Parameter:	slot	Slot number	
	port	Leg port number	

---

The `remove card tls BOOTPRA server` command removes a BootP Relay Agent server from a leg port.

Command            `>remove card tls <slot>BOOTPRA server <ip address>`

Parameter:	slot	Slot number
	ip address	IP address of the BOOTP Relay Agent server

The `set card tls BOOTPRA server name` command sets the BootP Relay Agent server name.

Command            `>set card tls <slot>BOOTPRA server <ip address> name <word>`

Parameter:	slot	Slot number
	ip address	IP address of the BOOTP Relay Agent server
	word	name for the BOOTP Relay Agent server

---

### Configuring VRRP on a leg port

The add port leg VRRP VRTR ip vrid command adds a VRRP virtual router to a leg port.

Command	>add port leg <slot>:<port>VRRP VRTR ip <ip address> vrid <number>	
Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of the VRRP virtual router
	number	id number of the virtual router

The remove port leg VRRP VRTR ip command removes a VRRP virtual router from a leg port.

Command	>remove port leg <slot>:<port>VRRP VRTR ip <ip address>	
Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of the VRRP virtual router

---

The set port leg VRRP VRTR mac command sets the MAC address of a VRRP virtual router.

Command	>set port leg <slot>:<port> VRRP VRTR <ip address> mac <word>	
Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of the VRRP virtual router
	word	MAC address of the VRRP virtual router

---

The `set port leg VRRP VRTR interval` command sets the VRRP virtual router advertisement interval and the dead interval in seconds.

Command	>set port leg <slot>:<port> VRRP VRTR <ip address> interval <number> dead <Dnumber>	
Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of the VRRP virtual router
	number	number of seconds of the VRRP virtual router advertisement interval
	Dnumber	number of seconds of the VRRP virtual router dead interval. That is, the number of seconds after which if no advertisement is received then the virtual router transitions to backup state

The `set port leg VRRP VRTR priority` command sets the VRRP virtual router priority for becoming master router.

Command	>set port leg <slot>:<port> VRRP VRTR <ip address> priority <number>	
Parameter:	slot	Slot number
	port	Leg port number
	ip address	IP address of the VRRP virtual router
	number	the priority level of the VRRP virtual router

---

### Configuring Smart Ringswitch TLS Module RIP operation

In addition to the leg port specific RIP configuration, there are additional card specific RIP configuration commands.

The add card tls RIP neighbor and remove card tls RIP neighbor commands configure the RIP neighbor list. Depending on the setting of the ignore neighbor flag (see set card tls RIP flags command below), this list controls from whom the TLS module accepts RIP updates.

Command:        >add card tls <slot> RIP neighbor <ip address>

Parameter:	slot	Slot number
	ip address	IP address, in dot notation, to add to RIP neighbor list

Command:        >remove card tls <slot> RIP neighbor <ip address>

Parameter:	slot	Slot number
	ip address	IP address, in dot notation, to remove from RIP neighbor list

---

The `set card tls RIP flags` and `clear card tls RIP flags` commands configure the global RIP algorithm. In these commands, enter the flags as a comma separated list.

Command:	>set card tls <slot> RIP flags <in>	
Parameter:	slot	Slot number
	in	Set the ignore neighbor list flag. This causes the router to accept RIP frames from all sources, ignoring the RIP neighbor list
Command:	>clear card tls <slot> RIP flags <in>	
Parameter:	slot	Slot number
	in	Clear the ignore neighbor list flag. This causes the router to ignore RIP frames from any source that is not present in the RIP neighbor list. If the RIP neighbor list is empty, and you clear this flag, no RIP routes will be learned

---

### Configuring Smart Ringswitch TLS Module OSPF operation

In addition to the leg port specific OSPF configuration, there are card specific OPPF configuration commands.



**Note:** These commands store the state of the OSPF protocol, but will not take effect until you re-boot the Ringswitch.

---

Use the `set card tls OSPF router id` command to globally configure the OSPF protocol on the TLS module. In this command, enter the flags as a comma separated list. If you do not want to use any flags enter `<>` to denote an empty list.

Command:	>set card tls <slot> OSPF router id <router id> flags <abs,tos,rrr,rsr>	
Parameter:	slot	Slot number
	router id	The OSPF router id in dot notation, (for example: 16.0.0.1)
	abs	Indicates that this is an Autonomous System Border router
	tos	Indicates that the Smart Ringswitch TLS Module will do OSPF type-of-service routing
	rrr	Causes the TLS module to redistribute RIP routes in OSPF routing announcements
	rsr	Causes the TLS module to redistribute static routes in OSPF routing announcements

The `add card tls OSPF area id` and `remove card tls OSPF area id` commands are used to configure the OSPF areas to which the Smart Ringswitch TLS Module is connected. In this command, enter the flags as a comma separated list. If you do not want to use any flags enter `< >` to denote an empty list.

Command:	>add card tls <slot> OSPF area id <area id> address <ip address> mask <subnetmask> flags <aar,ara,xrc>	
Parameter:	slot	Slot number
	area id	The OSPF area id in dot notation (for example: 0.0.0.0)
	ip address	IP address in dot notation of the IP network covered by this area (for example:192.168.16.0)
	subnet mask	IP subnet mask in dot notation of the IP network covered by this area (for example: 255.255.255.0)
	aar	Indicates that the area address range is enabled
	ara	Indicates that the advertising of summary routes to external areas is enabled
	xrc	Enables the flooding of Autonomous System external advertisements into/throughout the area. If AS advertisements are excluded from an area it is called a “stub”

---

Command:	>remove card tls <slot> OSPF area id <area id>	
Parameter:	slot	Slot number
	area id	The OSPF area id in dot notation (for example: 0.0.0.0)

The enable card tls OSPF command enables the OSPF protocol.

Command:	>enable card tls <slot> OSPF	
Parameter:	slot	Slot number

The disable card tls OSPF command disables the OSPF protocol.

Command:	>disable card tls <slot> OSPF	
Parameter:	slot	Slot number

### Configuring static IP routes

The add card tls static route and remove card tls static route commands are used to add and delete routes from the IP forwarding database.

Command: >add card tls <slot> static route <ip address> mask <subnet mask>  
gateway <gateway> metric <metric>

Parameter:	slot	Slot number
	ip address	Destination network address in dot notation
	subnet mask	Destination network subnet mask in dot notation
	gateway	IP address of the gateway to destination network in dot notation
	metric	Number of hops (1-15) to the destination network

Command: >remove card tls <slot> static route <ip address>

Parameter:	slot	Slot number
	ip address	Destination network address in dot notation

---

### Displaying Smart Ringswitch TLS Module status

The show port leg RIP setup command displays the current leg port RIP status.

Command:	>show port leg <slot:port> RIP setup	
Parameter:	slot	Slot number
	port	Leg port number

The show port leg RIP setup command displays the current leg port OSPF status.

Command:	>show port leg <slot:port> OSPF setup	
Parameter:	slot	Slot number
	port	Leg port number

The show card tls OSPF areas command displays the currently configured OSPF areas.

Command:	>show card tls <slot> OSPF areas	
Parameter:	slot	Slot number

The show card tls OSPF setup command displays the currently configured OSPF setup.

Command:	>show card tls <slot> OSPF setup	
Parameter:	slot	Slot number

---

The `show port leg OSPF setup` command displays the currently configured OSPF setup for a leg port.

Command:        `>show port leg <slot>:<port> OSPF setup`

Parameter:      slot                    Slot number

                 port                    Port number

---

The `show card tls RIP setup` command displays the currently configured RIP setup.

Command:        `>show card tls <slot> RIP setup`

Parameter:      slot                      Slot number

The `show card tls static routes` command displays the currently configured static routes.

Command:        `>show card tls <slot> static routes`

Parameter:      slot                      Slot number

The `show card tls all` command shows all the Smart Ringswitch TLS Module configuration.

Command:        `>show card tls <slot> all`

Parameter:      slot                      Slot number

The `show card tls BOOTPRA servers` command shows the BOOTP Relay Agent servers for the Smart Ringswitch TLS Module.

Command:        `>show card tls <slot> BOOTPRA servers`

Parameter:      slot                      Slot number

---

The `show port leg VRRP setup` command shows the VRRP setup for a leg port on the Smart Ringswitch TLS Module.

Command:        `>show port leg <slot>:<port> VRRP setup`

Parameter:      slot                    Slot number

                 port                    Port number

---

## Configuring the Smart Ringswitch 2-Port Ethernet Module

If you have a Smart Ringswitch 2-Port Ethernet Module installed, you can use additional commands to configure of the card.

### Setting the Ethernet port speed

The set Ethernet port speed negotiation mode command sets the speed at which an Ethernet port will attempt a successful link with another Ethernet interface.

Command:        >set Ethernet port speed negotiation mode <slot>:<port> <1,2,3>

Parameter:      slot                      Slot number

                  port                      Port number

                  1                          Auto

                  2                          10Mbps

                  3                          100Mbps

---

### Setting the Ethernet port duplex mode

The set Ethernet port duplex negotiation mode command sets the duplex mode at which an Ethernet port will attempt a successful link with another Ethernet interface.

Command:	>set Ethernet port duplex negotiation mode <slot>:<port> <1,2,3>	
Parameter:	slot	Slot number
	port	Port number
	1	Auto
	2	Half-duplex mode
	3	Full-duplex mode

### Setting the Ethernet port IPX mode

The set Ethernet port IPX mode command enables or disables the translational bridging of IPX frames.

Command:	>set Ethernet port IPX mode <slot>:<port> <1,2>	
Parameter:	slot	Slot number
	port	Port number
	1	Enable
	2	Disable

---

### Setting the Ethernet port token-ring IPX encapsulation mode

The set Ethernet port TRN IPX encapsulation mode command sets the encapsulation type on token ring for all IPX frames forwarded from Ethernet.

Command: >set Ethernet port TRN IPX encapsulation mode <slot>:<port> <1,2,3>

Parameter:	slot	Slot number
	port	Port number
	1	Auto
	2	IEEE8022
	3	SNAP

---

**Setting the Ethernet port Ethernet IPX encapsulation mode**

The set Ethernet port ETH IPX encapsulation mode command sets the encapsulation type on Ethernet for all IPX frames forwarded from token ring.

Command:	>set Ethernet port ETH IPX encapsulation mode <slot>:<port> <1,2,3,4,5>	
Parameter:	slot	Slot number
	port	Port number
	1	Auto
	2	IEEE8022
	3	SNAP
	4	IEEE8023
	5	Ethernet II (DIX)

---

### Setting the Ethernet port IPX address

The set Ethernet port IPX address command specifies the IPX network number for the port. If this is zero then the IPX network number is learned automatically by the Ethernet port.

Command:	>set Ethernet port IPX address <slot>:<port> <number>	
Parameter:	slot	Slot number
	port	Port number
	number	IPX network number

### Setting the Ethernet port IP mode

The set Ethernet port IP mode command enables or disables the translational bridging of IP frames.

Command:	>set Ethernet port IP mode <slot>:<port> <1,2>	
Parameter:	slot	Slot number
	port	Port number
	1	Enable
	2	Disable

---

### Setting the Ethernet port IP Multicast mode

The set Ethernet port IP multicast mode command specifies the type of MAC address to be used for all IP multicast frames received on Ethernet which will be forwarded onto token ring.

Command:	>set Ethernet port IP multicast mode <slot>:<port> <1,2,3>	
Parameter:	slot	Slot number
	port	Port number
	1	Broadcast
	2	Functional
	3	Group

### Setting the Ethernet port VLAN tagging mode

The set Ethernet port VLAN tagging mode command enables or disables the 802.1p priority tagging of frames onto Ethernet.

Command:	>set Ethernet port VLAN tagging mode <slot>:<port> <1,2>	
Parameter:	slot	Slot number
	port	Port number
	1	Enable
	2	Disable

---

### Setting the Ethernet port VLAN identity

The set Ethernet port VLAN ID command sets the Ethernet port VLAN identity. For this command to take effect, you must have already enabled VLAN 802.1p priority tagging on the selected port.

Command:	>set Ethernet port VLAN ID <slot>:<port> <number>	
Parameter:	slot	Slot number
	port	Port number
	number	VLAN ID

### Setting the Ethernet Spanning Tree encapsulation mode

The set Ethernet port STP encapsulation mode command enables or disables the process of encapsulating BPDUs from Ethernet when they are forwarded onto token ring, and de-encapsulating BPDUs when they are forwarded from token ring onto Ethernet.

Command:	>set Ethernet port STP encapsulation mode <slot>:<port> <1,2>	
Parameter:	slot	Slot number
	port	Port number
	1	Enable
	2	Disable

---

### Clearing the Ethernet port RIF Cache

The set Ethernet port RIF cache cleared command deletes the RIF cache for the specified Ethernet port. The cache is used when translating transparently forwarded Ethernet frames to source-routed token-ring frames.

Command:	>set Ethernet port RIF cache cleared <slot>:<port> <1>	
Parameter:	slot	Slot number
	port	Port number
	1	Clear

### Displaying Ethernet port information

The show Ethernet port information command displays all relevant Ethernet port information, including the outcome of any Auto mode settings when an Ethernet link is established.

Command:	>show Ethernet port information <slot>:<port>	
Parameter:	slot	Slot number
	port	Port number

---

## Viewing information about the port

You can get information about a port by using the `show port all` command. Alternatively, you can display subsets of that information by using the `show port characteristics`, `show port status`, and `show port counters` commands.

The `show port all` command displays all the information about the interface state, source-routing parameters, Spanning Tree parameters, and the frames that the port receives, transmits, and discards. The `show port characteristics` command displays information about whether the port is enabled or disabled by the administrator, the interface mode and ring speed of the port, whether source routing is enabled or disabled by the administrator, and the source-routing configuration of the port.

The `show port characteristics` command displays the following information about a token-ring module port.

Command:        `>show port characteristics <slot:port>`

Parameter:      slot            Slot number

                 port            Port number

---

The `show port characteristics` command displays the following information about a FDDI Module port. The command also displays additional information about whether the protocol fixup status is enabled or disabled, as shown in the following table:

Command:	>show port characteristics <slot:port>		
Parameter:	slot	Slot number	
	port	Port number	
Example:	Interface Admin. Status:	Enabled	
	Port Forwarding Mode	SRT Mode	
	S.R. Port Segment Number	409	
	S.R. Port Spanning Tree Mode:	Automatic	
	S.R. Port Hop Count	7	
	S.R. Port Spanning Tree Path Cost	100	
	Protocol Fixup Status:	Disabled	

If the port being displayed is an ATM port, then the command displays:

- the name of the Emulated LAN (ELAN) the LEC wishes to join or is a member of
- the ring number of the ELAN (if source routing is supported)
- the configured MAC address of the LEC interfaces
- the actual MAC address assigned by the LAN Emulation Server (LES)
- a range of LEC frame counters

---

When a LEC joins the ELAN, it can request the configured MAC address, but the LES may give it an alternate address. Accordingly, the actual MAC address may not be the same as the configured MAC address.

Command:	>show port characteristics <slot:port>	
Parameter:	slot	Slot number
	port	Port number
Example:	Interface Admin. Status: Enabled	
	Port Forwarding Mode: SR Mode	
	S.R. Port Segment Number: FFC	
	S.R. Port Spanning Tree Mode: Automatic	
	S.R. Port Hop Count: 7	
	S.R. Port Spanning Tree Path Cost: 100	
	Elan Name: Dave	
	Configured Ring Number: FFC	
	Actual Ring Number: FFC	
	Configured Mac Address: 0000f64301C9	
	Actual Mac Address: 0000f64301C9	
	LEC Rx Discards: 0	
	LEC Tx Discards: 0	
	LEC Tx Quota Discards: 0	
	LEC Tx BUS Broadcasts: 0	
	LEC Tx BUS Unknowns: 0	
	LEC Rx BUS Filtered: 0	

If the port being displayed is a TLS leg port, then the command also displays the leg port's configuration information.

Command: >show port characteristics <slot:port>

Parameter: slot Slot number

port Port number

Example:

Interface Admin. Status:	Enabled
Port Forwarding Mode:	SRT mode
S.R. Port Segment Number:	431
S.R. Port Spanning Tree Mode:	Forced
S.R. Port Hop Count:	7
S.R. Port Spanning Tree Path Cost:	0
LEG Port Name:	3ls2-sn4
LEG Port State:	Opened
LEG Port IP Address:	194.129.143.154
LEG Port IP Mask:	255.255.255.224
LEG Port IP MTU:	4428
LEG Port IP Multicast over:	Broadcast
LEG Port RIP Receive Type:	rip1orrip2
LEG Port RIP Send Type:	rip1
LEG Port RIP Flags:	ad,ah,as,ld,lh,sh
LEG Port RIPv2 Authentication:	None
LEG Port OSPF Area Id:	0.0.0.0
LEG Port Subnet Group:	1:1 1:2

---

The `show port status` command displays whether the port is enabled or disabled, the MAC address of the port, the source-routing status of the port, and the transparent bridging status of the port. To find out the whether the port interface, source routing and transparent bridging are enabled or disabled by the administrator, use the `show port characteristics` command.

Command:        `>show port status <slot:port>`

Parameter:      slot                    Slot number  
  
                  port                    Port number

Example:        Bridge Port Number                    (1)  
                  Interface Actual Status:                Enabled  
                  Interface Active MAC Address:            0000F65E10C1  
                  S.R. Port Actual Status:                Disabled  
                  S.R. Port Spanning Tree Broadcast:       Enabled  
                  S.R. Port Designated Bridge:            00006F7A0803  
                  T.B. Port Actual Status:                Enabled

---

The `show port counters` command displays the number of frames and bytes that the Ringswitch receives, transmits, and discards for all frames.

Command:	>show port counters <slot:port>		
Parameter:	slot	Slot number	
	port	Port number	
Example:	Bytes Transmitted:	2,076,520,710	
	Bytes Received:	2,254,416,704	
	Specifically Routed Frames Transmitted:	6,103,083	
	Specifically Routed Frames Received:	12,348,042	
	All Routes Explorer Frames Received:	1	
	All Routes Explorer Frames Transmitted:	35	
	Spanning Tree Explorer Frames Received:	3,796	
	Spanning Tree Explorer Frames Transmitted:	9,623	
	Receiving Segment Mismatch Discards:	0	
	Duplicate Segment Mismatch Discards:	2	
	ARE Hop Count Exceeded Discards:	0	
	Transparent bridged Frames Transmitted:	8,627,458	
	Transparent bridged Frames Received:	15,559,074	



## Features of previous software releases

### Features supported by Software Release 4.0

Ringswitch Software Release 4.0 supports the Smart Ringswitch Plus Chassis and the Smart Ringswitch Express and introduces support for the Smart Ringswitch TLS Module, the Smart Ringswitch 8-Port Fiber Module, the Smart Ringswitch 8-Port HSTR Copper Module, and the Smart Ringswitch 8-Port HSTR Fiber Module. Ringswitch Software Release 4.0 introduces 18K frame support, Fast Failover for HSTR ports, and Ethernet LEC for the Smart Ringswitch ATM Module.



**Note:** To identify files containing boot code and run-time microcode, examine the first four letters in the file name as shown in Table H.1. The remaining characters in the file name denote the version number of the software. For the most up-to-date information about version numbers, refer to the README.TXT file on the accompanying CD.

*Table H.1 Ringswitch software modules in Release 4.0*

Microcode module	Switch module/Ringswitch	File name	Versions
Run-time	Switch-3 Module	SRPW406R.BIN	4.06
Multi-Download file	Switch-3 Module	REL4_0.BIN	4.0
FDDI firmware	Switch-3 Module	SRSF216R.BIN	2.16

---

## Features supported by Software Release 3.3

Ringswitch Software Release 3.3 supports the Smart Ringswitch Plus and the Smart Ringswitch Express and introduces support for the Smart Ringswitch 4-Port HSTR Copper Module, the Smart Ringswitch 2-Port HSTR Fiber Module, and Multi-Download.

Multi-Download will greatly simplify the future upgrades of your Ringswitch software by combining most downloadable files into a single file including Switch bootcode, Switch microcode, HSTR microcode, and ATM microcode. You only need to download the one file and your Ringswitch is upgraded.

Madge strongly recommends you upgrade to Release 3.3 to be ready for Multi-Download.



**Note:** To identify files containing boot code and run-time microcode, examine the first four letters in the file name as shown in Table 12.1. The remaining characters in the file name denote the version number of the software. For the most up-to-date information about version numbers, refer to the README.TXT file on the accompanying CD.

---

*Table 12.1 Ringswitch software modules in Release 3.3*

Microcode module	Switch module/Ringswitch	Filename	Versions
Run-time	Switch-3 Module	SRPW387R.BIN	3.87
Boot flash	Switch-3 Module (Switch 113)	SRPB3507.BIN	3.05.07
	Switch-3 Module (Switch 113b)	SRPV3507.BIN	
	Smart Ringswitch Express* (part number: 058-270-04)	SRPB3507.BIN	
	Smart Ringswitch Express* (part number: 058-270-05)	SRPV3507.BIN	
HSTR Firmware	Switch-3 Module	HSTR1023.BIN	1.00.23
FDDI firmware	Switch-3 Module	SRSF216R.BIN	2.16
ATM firmware	Switch-3 Module	SRSA2510.BIN	2.05.10

\* Look at the rear of your Ringswitch Express to see the Part Number

---

## Features supported by Software Release 3.2

Smart Ringswitch Software Release 3.2 supports the Smart Ringswitch, the Smart Ringswitch Plus and the Smart Ringswitch Express and introduces support for the GroupSwitch Module, Protocol Filtering, and Traffic Profiling.



**Note:** To identify files containing boot code and run-time microcode, examine the first four letters in the file name as shown in Table H.2. The remaining characters in the file name denote the version number of the software.

---

*Table H.2 Ringswitch software modules in Release 3.2*

Module	Filename	Versions
Run-time	Switch-1 Module SRSW358R.BIN Switch-2 Module SRSW358R.BIN Switch-3 Module SRPW358R.BIN Smart Ringswitch Express SRPW358R.BIN	3.58
Flash boot	Switch-1 Module SRSB3308.BIN Switch-2 Module SRST3308.BIN Switch-3 Module SRPB3308.BIN Smart Ringswitch Express SRPB3308.BIN	3.03.08
FDDI firmware	SRSF215R.BIN	2.15
ATM firmware	SRSA2058.BIN	2.05.08

---

## Features supported by Software Release 3.1

Smart Ringswitch Software Release 3.1 introduces support for the Switch-3 Module hardware. For devices with a Switch-3 Module, the following new features are supported:

- Smart Ringswitch 8-Port TR Copper Module
- Smart Ringswitch Plus Chassis

The following table describes the modules in Software Release 3.1.

*Table H.3 Ringswitch software in release 3.1*

Module	File name	Versions
Run-time	SRPW328R.BIN	3.28
Flash boot	SRPB3108.BIN	3.01.08
FDDI firmware	SRSF213R.BIN	2.13
ATM firmware	SRSA205R.BIN	2.05

---

## Features supported by Software Release 3.0

Smart Ringswitch Software Release 3.0 introduces support for the Ringswitch ATM Module. The following table describes the modules in Software Release 3.0.

*Table H.4 Ringswitch software in release 3.0*

Module	File name	Versions
Run-time	SRSW306R.BIN	3.06
Flash boot	SRSB3106.BIN	3.01.06
	SRST3106.BIN	3.01.06
FDDI firmware	SRSF208R.BIN	2.08
ATM firmware	SRSA108R.BIN	1.08

---

## Features supported by Software Release 2.1

Smart Ringswitch Software Release 2.1 introduces transparent bridging over FDDI. The following table describes the modules in Software Release 2.1

*Table H.5 Ringswitch software in release 2.1*

Module	File name	Versions
Run-time	SRSW227R.BIN	2.27
Flash boot	SRSB2205.BIN	2.02.05
	SRST2205.BIN	2.02.05
FDDI firmware	SRSF208R.BIN	2.08

## Features supported by Software Release 2.0

Smart Ringswitch Software Release 2.0 introduces support for the Switch 2 Module hardware. To support transparent bridging, Source-Route Transparent bridging, or Source-Route Transparent Plus bridging, the Ringswitch device must have a Switch-2 Module installed. For devices with a Switch-1 Module, the following features are supported:

- Active Broadcast Control (ABC)
- Remote Monitoring (RMON)  
To use the RMON agent, you must obtain a Remote Monitoring (RMON) Agent Software License (part number: 84-27) from Madge Networks.
- IP address discovery support for BOOTP, RARP, or DHCP

---

For devices with a Switch-2 Module, all the features described above are supported. The following additional features are supported:

- Transparent bridging
- Source-Route Transparent bridging
- Source-Route Transparent Plus bridging

The following table describes the modules in Software Release 2.0.

*Table H.6 Ringswitch software in release 2.0*

Module	File name	Versions
Run-time	SRSW204R.BIN	2.04
Flash boot	SRSB2104.BIN	2.01.04
	SRST2104.BIN	2.01.04
FDDI firmware	SRSF107R.BIN	1.07

---

## Features supported by Software Release 1.4

Smart Ringswitch Software Release 1.4 adds the following features:

- Ringswitch FDDI Module
- Ringswitch Fiber Token Ring Port Module

The following table describes the modules in Software Release 1.4.

*Table H.7 Ringswitch software in release 1.4*

Module	File name	Versions
Run-time	SRSW158R.BIN	1.58
Flash boot	SRSB1406.BIN	1.04.06
FDDI firmware	SRSF106R.BIN	1.04.23

---

## Features supported by Software Release 1.3

Smart Ringswitch Software Release 1.3 adds the following features:

- IEEE 802.5r (draft 3) full-duplex, or Dedicated Token Ring (DTR), connections
- Ring Parameter Server (RPS) feature
- ASIC Token Ring Port Module

The following table describes the modules in Software Release 1.3.

*Table H.8 Ringswitch software in release 1.3*

Module	File name	Versions
Run-time	SRSW135R.BIN	1.35
Flash boot	SRSB1305.BIN	1.03.05

---

## Features supported by Software Release 1.2

Smart Ringswitch Software Release 1.2 adds the following features:

- Routing Information Protocol (RIP) and Service Advertising Protocol (SAP) frame suppression and All Routes Explorer (ARE) conversion broadcast control features
- Per-port enable/disable for cut-through switching
- Enhanced reset button functionality with system configuration reset and erase feature for boot code and run-time code
- Microcode download via Trivial File Transfer Protocol (TFTP) over IP or IPX

The following table describes the modules in Software Release 1.2.

*Table H.9 Ringswitch software in release 1.2*

Module	File name	Versions
Run-time	SRSW118R.BIN	1.18
Flash boot	SRSB1201.BIN	1.02.01

---

## Features supported by Software Release 1.1

Smart Ringswitch Software Release 1.1 adds support for up to 12 copper Token Ring ports to the functionality provided by the previous release.

The following table describes the module in Software Release 1.1.

*Table H.10 Ringswitch software in release 1.1*

Module	File name	Versions
Run-time	SRSW107R.BIN	1.07

## Features supported by Software Release 1.0

Smart Ringswitch Software Release 1.0 is the first software release, supporting up to 8 copper Token Ring ports.

The following table describes the module in Software Release 1.0.

*Table H.11 Ringswitch software in release 1.0*

Module	File name	Versions
Run-time	SRSW103R.BIN	1.03

## Troubleshooting

---

If the Ringswitch does not work correctly when the installation is complete, use the procedures described in this appendix to diagnose the cause of the problem. Also read the chapters in this guide which describe how to use correctly the modules installed in your Ringswitch.

The section “Troubleshooting management problems” describes problems that may occur when you use TrueView Ringswitch Manager to manage the Ringswitch. For information about using TrueView Ringswitch Manager, refer to the booklet accompanying the Ringswitch CD.



---

**Warning:** The Ringswitch does not contain any user-serviceable components. Do not open the unit except when installing a module.

---

### Troubleshooting messages on the LCD panel

When a Ringswitch re-boots, the LCD displays alert messages as well as information about each of the modules in the chassis.

Press the paddle switch *downwards* to display information about each of the installed modules. Information about each of the modules is displayed in the order they are inserted into the chassis, reading from top to bottom. Click the paddle switch *upwards* to display more detailed individual port information about the currently selected module. If no specific message is given, contact your customer service representative quoting any error number displayed.

---

If the module is functioning correctly, the LCD will display the slot number, module type, and microcode version of the selected module, as shown in the following table.

*Table I.1      The LCD message displayed by a correctly functioning FDDI Module*

Message	Description
Slot <n> FDDI Rev xx.xx.xx	Correctly functioning FDDI Module

The following messages will be displayed if the microcode in the currently displayed module needs updating.

*Table I.2      Microcode related messages on the LCD panel*

Message	Description
FDDI messages	
Slot <n> FDDI Rev Unknown (Disabled)	The FDDI Module is running microcode older than v 2.08. The module must be moved to any of the top three slots before it can be upgraded
Slot <n> FDDI Rev xx.xx.xx (No Open)	The FDDI Module is running microcode older than v 2.08. The module must be upgraded before the FDDI interface is enabled. The upgrade must occur via a port other than FDDI Module's port

*Table I.2 Microcode related messages on the LCD panel*

Message	Description
Slot <n> FDDI Rev xx.xx.xx (No Fwd)	The FDDI Module is running microcode older than v 2.10. The module must be upgraded before the FDDI interface is enabled for bridging. This upgrade can occur via the module's own port
ATM messages	
Slot <n> MMF ATM Rev xx.xx.xx (No Fwd)	The ATM Module is running microcode older than v 2.00. The module must be upgraded before the ATM interface is enabled for bridging. This upgrade can occur via the module's own port

The following alert messages may also be displayed on the LCD.

*Table I.3 Alert messages on the LCD panel*

Message	Description
General messages	
Manager requested load of new code	A management station running TrueView Ringswitch Manager has sent a request to the Ringswitch to download new code

*Table I.3 Alert messages on the LCD panel*

Message	Description
Burnt-in Address is not valid	To confirm the problem, reset the Ringswitch to start the self-test program, which tests the burnt-in addresses of the Ringswitch and each token-ring port. Record any failures
Token-ring messages	
Port <slot:port>: Open success	The Ringswitch successfully connected the port to the ring
Port <slot:port>: Open failed Check cable	The Ringswitch failed to connect the token-ring port to the ring. Check that the cables are not loose or wrongly connected
Port <slot:port>: Open failed Check ring speed	The Ringswitch failed to connect the token-ring port to the ring. Check that the ring speed is correct for the ring by using the serial interface or TrueView Ringswitch Manager
Port <slot:port>: Open failed Signal loss	The Ringswitch failed to connect the token-ring port to the ring because the port is not receiving a valid token-ring signal from the ring. Check that the cable is not disconnected or broken
Port <slot:port>: Open failed Duplicate address	The Ringswitch failed to connect the token-ring port to the ring because there are two ports on the ring with the same Locally Administered Address (LAA). Check the node addresses of the port and nodes on the ring

*Table I.3 Alert messages on the LCD panel*

Message	Description
Port <slot:port>: Open failed Beacon on open	The Ringswitch failed to connect the token-ring port to the ring because the ring is beaconing. Check your network connections
Port <slot:port>: Open failed No reply from RPS	The Ringswitch failed to connect the token-ring port to the ring because there is no response from the Ring Parameter Server (RPS). Check your network management software and ensure that other bridges on your network are functioning correctly
Port <slot:port>: Open failed Remove received	A management program prevented a token-ring port from opening onto the ring because it detected a fault. Check the alert/event log on the management program
Port <slot:port>: Open failed Upgrade software	The Ringswitch failed to open a port because an upgrade of software is required
Port <slot:port>: Open failed Unsupported ring speed	A token-ring port has been configured with a speed of 4Mbps. When the Ringswitch is in 18K mode all 4Mbps ports will be disabled. (The IEEE standard does not allow 4Mbps links to support frame sizes great then 4.5K.) The Ringswitch LCD will display the message Unsupported Ring Speed for those 4Mbps ports that are enabled. Open the card at 16Mbps

---

*Table I.3      Alert messages on the LCD panel*

Message	Description
Port x:y Open Failed Registration failure	The port, configured for Full Duplex Only, has failed to get a response to its DTR registration request. Usually caused by a cable fault or connection to a Classic-only device
Port x:y Open Failed Registration rejected	The port, set to Full Duplex Only, has requested a Full Duplex connection but this has been refused by the other link entity. Usually caused by a concentrator port configured as Classic-only
Port x:y Open Failed No link status	The HSTR port cannot open because link status has not been detected by the Ringswitch. This is usually caused by a cable fault
Port x:y Open Failed Lobe test timeout	The port's Full Duplex lobe test has taken too long to complete. This can be caused if the concentrator is too slow in responding to the test frames
Port <slot:port>: Open failed	The Ringswitch failed to connect the token-ring port to the ring because an unexpected problem occurred. Contact your customer service representative and quote the error number
Port <slot:port>: Ring status normal	The token ring to which the token-ring port is connected is operating normally

*Table I.3 Alert messages on the LCD panel*

Message	Description
Port <slot:port>: Closed Auto removal	The token-ring port removed itself from the ring because a fault exists. Check that the cable is not disconnected or broken
Port <slot:port>: Closed Remove received	A management program removed a token-ring port from the ring because it detected a fault. Check alert/event log on the management station
Port <slot:port>: Closed Wire fault	The token-ring port was removed from the ring because a problem exists between the port and the device to which it is connected. Check the cable connections
Port <slot:port>: Closed Signal loss	The Ringswitch failed to connect the token-ring port to the ring because the port is not receiving a valid token-ring signal from the ring. Check that the cable is not disconnected or broken
Port <slot:port>: Closed Beaconing	The ring to which the token-ring port is connected is beaconing. Check your network connections

---

*Table I.3      Alert messages on the LCD panel*

Message	Description
Port <slot:port>: Closed Hard error	The ring to which the token-ring port is connected is inoperative because a hard error occurred. Typical hard errors include: <ul style="list-style-type: none"><li>• faulty adapter card</li><li>• hardware incompatibility</li></ul> Check your network connections
Port <slot:port>: Closed Single station	The token-ring port is the only node on the ring. This message does not represent an error condition unless you expect more nodes to appear on the ring
Port <slot:port>: Ring <no.> found RPS disabled	When the port opened, a Ring Parameter Server (RPS) supplied a ring number different to that configured for the port. The RPS function has been disabled for the Ringswitch port

*Table I.3 Alert messages on the LCD panel*

Message	Description
HSTR Fast Failover messages	
FFO S:(P)/Q Link Down Primary Open Fail	The Fast Failover link is not operational. The Ringswitch only displays this message on the node side of the Fast Failover link. The port has failed to open. Check the cable
FFO S:(P)/Q Link Up Standby Open Fail	The Fast Failover link is operational, but the standby link is not operational. The Ringswitch only displays this message on the node side of the Fast Failover link. The port has failed to open. Check the cable
FFO S:(P)/Q Link Swapped	A Fast Failover switch-over has taken place because the active link failed. Check the cable

*Table I.3      Alert messages on the LCD panel*

Message	Description
ATM messages	
Slot<n> ATM Rev xx.xx.xx (No Open)	You see this message if you have enabled 18k mode on the Ringswitch and the ATM microcode needs upgrading. Upgrade the ATM microcode to version 3.09 or later
LEC <slot:port>: Open failed Can't find LECS	The ATM module has failed to discover the LECS using the enabled methods. The permissible methods are using ILMI, using the Well Known Address, or using PVC 17. Make sure that LECS is active and that ATM routing is functioning correctly
LEC <slot:port>: Open failed Config failed	The LECS is not configured with an ELAN of the name or type that the ATM module is requesting. Check that the LECS and the ATM module are configured correctly, that the ELAN name is correct, and that the default token-ring LES is correctly specified in the LECS configuration
LEC <slot:port>: Open failed LES connect failed	The ATM module has failed to connect to the LES. Check that the LES is active. If it is not active, ATM routing may not be functioning correctly. Check that the local switch has a good route to the LES and the Ringswitch

*Table I.3 Alert messages on the LCD panel*

Message	Description
LEC <slot:port>: Open failed Join failed	The LES has not admitted the LEC to the ELAN. This can happen on a closed ELAN (one that has been configured to exclude the client)
LEC <slot:port>: Open failed Can't find BUS	An Address Resolution Protocol (ARP) request by the LEC for the ATM address of the BUS has failed
LEC <slot:port>: Open failed BUS connect failed	The LEC has failed to connect to the BUS
LEC <slot:port>: Open failed No VC from BUS	The BUS has failed to set up a VC back to the LEC
LEC <slot:port>: Open failed Second LEC on ELAN	An attempt was made by a second LEC on the ATM card to join an ELAN that another LEC on the ATM card is already a member of. No two LECs on the same ATM card can be configured to join the same ELAN
LEC <slot:port>: Open failed LES VC dropped	The VC from the LES has been dropped
LEC <slot:port>: Open failed BUS VC dropped	The VC from the BUS has been dropped

---

*Table I.3      Alert messages on the LCD panel*

Message	Description
LEC <slot:port>: Open failed Rejoined wrong ELAN	The LEC has unexpectedly left the ELAN. The LEC has then attempted to rejoin the ELAN using the previously successful configuration and has been successful. However, it has joined a different ELAN due to a problem with the LECS
LEC <slot:port>: Open failed Insufficient memory	The ATM module has insufficient memory
TLS messages	
Slot <n> TLS Unsupported in slots 1-3	The location of a disabled Smart Ringswitch TLS Module within the Ringswitch. The module is not supported in slots 1-3 of the Smart Ringswitch Plus Chassis
Slot <n> TLS 2nd TLS card unsupported	The location of a disabled Smart Ringswitch TLS Module within the Ringswitch. Multiple Smart Ringswitch TLS Modules are not supported. Remove all but one of the Smart Ringswitch TLS Modules

---

## Troubleshooting hardware faults

This section describes how to diagnose, isolate, and recover from, hardware faults. If a fault can be isolated to a module or port, you can override the self test and continue using the Ringswitch until a replacement is available.

When you start up the Ringswitch or reset the device, the resident self test program automatically checks that the Ringswitch is operating correctly. If the Ringswitch fails the self test, the information on the LCD and LEDs enables you to isolate the cause of a fault and determine whether you can continue using the Ringswitch until a replacement is available.



---

**Caution:** If a cooling fan inside the Ringswitch fails, the fault is reported on the LCD but the self test is not halted. You can continue using the Ringswitch until a replacement is available. If the unit is a Smart Ringswitch Plus, the fault may indicate the failure of a PSU Module. A green LED on the PSU Module indicates that it is working. A red LED on the PSU Module indicates that the module is faulty.

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## Running the self test program

To run the self test program, reset the Ringswitch. During the self test, the system status LED indicates the status of the test as described in Table I.8.

*Table I.4      System status LED states during the startup self test*

LED state	Description
green	The startup self test is running
yellow	This is a warning condition. The Ringswitch failed one or more non-critical tests. The self test continues automatically after approximately three seconds
red	The Ringswitch has failed the self test. The LCD displays a warning message (see Table I.7) for approximately three seconds, then the Ringswitch resets and the self-test restarts. Record the failed test number

---

## Self test procedure

When you start up the Ringswitch:

- 1 The program tests the low-level hardware functions.

If the Ringswitch fails the low-level self test:

- the self test program halts the startup process
- the high-level functions are not tested

If the Ringswitch fails the low-level self test, contact your customer service representative (see the section “Reporting faults”).

- 2 The program tests the high-level functions. During the high-level self test, the LCD displays the messages described in Table I.6.

If the Ringswitch fails the high-level self test:

- the LCD displays a message for approximately three seconds and illuminates the port LEDs to identify faulty ports
- the self test program restarts, and the number of the failed test is displayed together with additional information about the problem

Record any information the Ringswitch displays. High-level tests are repeated until the self test is completed successfully, or you override the self test failure (see the section “Overriding a self test failure”).

If the Ringswitch fails the high-level self test, contact your customer service representative (see the section “Reporting faults”).

- 3 The program checks that microcode exists in memory, and the Ringswitch starts up.

If microcode is not present in memory, the loader program waits for new microcode to be downloaded from the management station. At startup, the LCD panel displays the messages shown in Table I.5.

---

*Table I.5      LCD Display during startup*

Startup stage	Status LED	Description
Token Ring Switch 1.00 10-03-95 10:34	green	The Ringswitch is starting up with the default boot code stored in flash memory. Displays the version number of the boot software, and the date and time that the software was released
Flash Token Ring Switch 2.00 10-08-96 14:45		The Ringswitch is starting up with a flash boot upgrade that has been downloaded to the switch

During the self-test, the LCD may display the messages shown in Table I.6.

*Table I.6      LCD display during self-test*

Startup stage	LED	Description
*** System Self Test *** Running Test <test number>	green	Displays the number of each stage in the self test. Normally the tests are carried out too quickly for the numbers to be visible
Test <test number> Failed <additional information>	red	The specified test caused the Ringswitch to fail the self test

*Table I.6 LCD display during self-test*

Startup stage	LED	Description
Test <test number> Warning <additional information>	yellow	A non-critical test such as a fan failure was found. The self test continues automatically after approximately three seconds

---

When the self-test is complete, the LCD may display the messages shown in Table I.7.

*Table I.7 LCD display after completion of self-test*

Startup stage	LED	Description
System Self Test PASSED	green	Indicates that the self test is complete and the Ringswitch has passed the test
System Self Test Failed Overridden by user	yellow	Indicates that you have started the Ringswitch by overriding the self test. For information about overriding the self test, see “Overriding a self test failure”
System Self Test Failed Unit Resetting...	red	A test failed and the self-test was halted. The LCD displays the message for approximately three seconds, then the Ringswitch resets and the self-test restarts

## Isolating faults

If the Ringswitch fails the high-level self test, you can override the self test failure to start up the Ringswitch. Use the information provided by the LCD and LEDs to determine whether you can continue using the Ringswitch until a replacement unit is available. For information about overriding a self test failure, see “Overriding a self test failure”.

Once the startup self test is complete, the system status LED indicates the status of the test as described in Table I.8.

*Table I.8 System status LED states after the startup self test*

LED state	Description
green	The Ringswitch is operating normally
yellow	This is a warning condition. The Ringswitch failed the system self test, but the system self test has been overridden by the user. The Ringswitch may not operate as expected

---

To isolate the cause of a self test failure:

- 1 Check the LCD panel.

If the Ringswitch fails on a test number less than 110, a fault exists in the switch module. If the Ringswitch fails test number 110, a fault may exist in the switch module.

Contact your customer service representative (see the section “Reporting faults”).

- 2 Check the LCD panel and the port LEDs.

If the Ringswitch failed between tests 121 and 126 inclusive, the LCD indicates the first token-ring port that failed. The ports that failed the self test are shown by red LEDs.

You may continue using the Ringswitch by overriding the self test failure as described in this section. Do not use a token-ring port if the port LED is lit red during the test.

- 3 Check that all the upper LEDs on token-ring ports are flashing yellow during test 121.

During test 121, the upper LEDs on each token-ring port flash in yellow. If any LEDs are not lit at all, there is a fault in one of the port modules. This also prevents the program from lighting the port LEDs in red to indicate that they failed the self test.

You may continue using the Ringswitch by overriding the self test failure as described in this section. Do not use a token-ring port if the upper LED does not flash yellow during test 121.

### **Overriding a self test failure**

You can override a self test failure to continue using the Ringswitch until a replacement is available.

To override a self test failure, use either of the following methods:

- press the paddle switch downwards to ignore the failure and proceed to the next test
- press the paddle switch upwards to abort the self test and start up the Ringswitch

When you override a self test failure, the system status LED remains yellow, to indicate that the Ringswitch has not passed the self test.

---

## Reporting faults

If a hardware error occurs, depress the paddle switch to view information about which hardware you have, then contact your customer service representative with the following information:

- the test numbers and additional information that appear on the LCD during the self test
- the LEDs that are lit on each of the ports
- the version numbers of the hardware and software



**Note:** You can use the command line interface (the `show bridge all` command) to display information about which modules are in which slots and the versions of code that the Ringswitch and its modules are using. For more information, see [Viewing information about the Ringswitch in Appendix G, Using the command line interface](#).

---

---

## Troubleshooting management problems

This section describes how to remedy some problems that may occur when you use TrueView Ringswitch Manager to manage the Ringswitch.

To get information about the Ringswitch:

- use TrueView Ringswitch Manager. For information about using TrueView Ringswitch Manager, refer to the booklet accompanying the Smart Ringswitch CD
- read the port LEDs and the LCD messages:
  - for information about the status indicators, see Chapter 11, Reading status indicators
  - for information about LCD alert messages, see Table I.3, Alert messages on the LCD panel
- connect a terminal to the serial port and use the command-line interface. For information about configuring the Ringswitch using the command-line interface, see Appendix G, Using the command line interface

You can also configure the Ringswitch and ports on the device by using TrueView Ringswitch Manager or the command-line interface.

---

### Cannot manage the Ringswitch

If you cannot manage a Ringswitch using TrueView Ringswitch Manager:

- 1 Check the protocol that Ringswitch Manager is using to manage the Ringswitch, using the Ringswitch Manager Table.
- 2 Check that the network connecting the management station to the Ringswitch supports the protocol.
- 3 If the Ringswitch is managed using IP:
  - check the IP address by reading the LCD panel. You can set an IP address by connecting a terminal to the serial interface and using the `set bridge ip address` command
  - in TrueView Ringswitch Manager, add the Ringswitch to the database by specifying the IP address. If already added, delete icon and re-add
  - ping the Ringswitch from the DOS prompt to confirm IP connectivity

### Token-ring port fails to open

If a token-ring port fails to open:

- 1 Make sure the token-ring port is connected to the correct connector on the attached device (see the section “Connecting devices” in Chapter 3, “Connecting token-ring ports”).
- 2 Make sure the port ring speed (4, 16, or 100 Mbps) is correct for the ring that is connected to the port.

You can change the ring speed by using TrueView Ringswitch Manager, or by connecting a terminal to the serial interface and using the `set port ifspeed` command.

- 3 Make sure the interface mode (node or concentrator) of the token-ring port is appropriate for the attached device.

You can change the port interface mode by using TrueView Ringswitch Manager, or by connecting a terminal to the serial interface and using the `set port ifmode` command.

---

## Problems forwarding source-routed frames

If there are problems forwarding source routed frames:

- 1 Check that source routing is enabled for the Ringswitch and for the appropriate port  
You can enable or disable source routing for the Ringswitch and each port by using TrueView Ringswitch Manager, or connecting a terminal to the serial interface and using the `set bridge forwarding` and `set port forwarding` commands. For more information, see Appendix G, Using the command line interface.
- 2 If the Ringswitch is in Source-Route Transparent Plus mode, check that the forwarding mode is set correctly and that Source Routing and Transparent bridging are enabled for all ports that share a ring number.
- 3 Make sure you have enabled Source Routing drivers on workstations and servers.
- 4 Check that the bridge number of the Ringswitch is a hexadecimal number in the range 0 through F, and that there are no other devices with the same bridge number connecting the same rings.
- 5 Check the ring number of each token-ring port and, unless the Ringswitch is in Source-Route Transparent Plus forwarding mode, make sure each port has a different ring number. If two Ringswitch devices are directly connected by their token-ring ports, make sure the ring number is identical for both token-ring ports.  
You can set the ring number by using TrueView Ringswitch Manager, or by connecting a terminal to the serial interface and using the `set port segment` command.

---

## Problems forwarding source-route broadcast frames

If there are problems forwarding source-route broadcast frames:

- 1 Check that source-routing virtual LANs are configured correctly, and that each Ringswitch has an up-to-date record of virtual LANs. To check the virtual LAN configuration, use TrueView Ringswitch Manager.  
Before creating new virtual LANs, make sure you delete the existing virtual LANs that are causing problems forwarding source routing frames.
- 2 Check that the type of station connected to each token-ring port is defined correctly. On IPX and Netbios networks, the Ringswitch uses information about the type of station to block broadcast frames originating on workstation-only rings and destined for other workstation-only rings.  
To check the station type for each token-ring port, use TrueView Ringswitch Manager.
- 3 Check the Active Broadcast Control (ABC) filters. Try flushing the filter caches to check whether an improperly set timeout value is affected the forwarding of frames. Check whether disabling the filters removes the problem.

## Problems forwarding transparent-bridged frames

If there are problems forwarding transparent-bridged frames:

- 1 Check that Transparent bridging is enabled for the Ringswitch and ports.
- 2 Check the Active Broadcast Control (ABC) filters. Try flushing the filter caches to check whether an improperly set timeout value is affecting the forwarding of frames. Check whether disabling the filters removes the problem.
- 3 Make sure you have removed Source Routing drivers from appropriate protocol stacks (for example you might want source routing on IP but not on IPX), workstations and servers.
- 4 Check you transparent VLANs. For more information, see Appendix E, About virtual LANs.

---

## Current ratings

Use the information in this section to ensure that the sum of the current ratings for the modules you install does not exceed the maximum permissible rating for your Smart Ringswitch.

### Ringswitch chassis current rating

The following table displays the current ratings for the Ringswitch units.

*Table J.1 Current ratings for Ringswitch units*

Model	Maximum +5V dc load	Maximum +12V dc load
Smart Ringswitch Chassis	21.5A	2.1A
Smart Ringswitch Plus Chassis	40.0A	1.5A
Ringswitch Express	24.0A	1.0A

---

## Ringswitch modules current ratings

Refer to the following table to make sure that the sum of the current ratings for the modules you install does not exceed the maximum permissible rating for your Ringswitch.

To identify a module, refer to the identification number printed on the metal carrier or to the number on the printed circuit board. In the identification numbers shown in the following table, the symbols *xx* represent the revision number of the hardware.

*Table J.2      Current ratings for Ringswitch modules*

Module	Circuit board i.d. number	Metal carrier i.d. number	Maximum +5V dc load	Maximum +12V dc load
Switch-1 Module	157-039- <i>xx</i>	Switch 111	4.3A	0.2A
Switch-2 Module	157-159- <i>xx</i>	Switch 112	4.3A	0.2A
Switch-3 Module	157-662- <i>xx</i> 157-957- <i>xx</i>	Switch 113 Switch 113b	8.0A 6.0A	0.1A 0.1A
Smart Ringswitch 4-Port TR Copper Module	157-040- <i>xx</i> 157-047- <i>xx</i>	TRP 120 TRP 121	4.2A	0.2A
Smart Ringswitch 4-Port TR Fiber Module	157-199- <i>xx</i>	TRP 130	3.8A	None
Smart Ringswitch 8-Port TR Fiber Module	158-054- <i>xx</i>	TRP 131	3.1A	None

*Table J.2 Current ratings for Ringswitch modules*

Module	Circuit board i.d. number	Metal carrier i.d. number	Maximum +5V dc load	Maximum +12V dc load
Smart Ringswitch 8-Port TR Copper Module	157-615-xx 157-930-xx	TRP 122 TRP 123	5.6A 2.5A	None 0.1A
Smart Ringswitch FDDI Module	157-050-xx	FDDI 140	3.8A	None
Ringswitch ATM Module MMF	157-532-xx	ATM 160	5.25A	0.25A
Ringswitch ATM Module SMF	157-785-xx	ATM 161		
Smart GroupSwitch Module	157-514-xx	Group 150	3.7A	None
Smart Ringswitch 4-Port HSTR Copper Module	157-959-xx	HSTR 171	4A	None
Smart Ringswitch 2-Port HSTR Fiber Module	157-980-xx	HSTR 172	4A	None
Smart Ringswitch 8-Port HSTR Copper Module	158-094-xx	HSTR100.174	3.5A	None
Smart Ringswitch 8-Port HSTR Fiber Module	158-095-xx	HSTR100.175	5.3A	None

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*Table J.2      Current ratings for Ringswitch modules*

Module	Circuit board i.d. number	Metal carrier i.d. number	Maximum +5V dc load	Maximum +12V dc load
Smart Ringswitch TLS Module	158-015-xx	TLS 180	5.25A	0.25A
Smart Ringswitch 2-Port Ethernet Module	158-046-xx	Ethernet 10/100 190	2.5A	0.25A

# Technical support services

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## World Wide Web (WWW)

To access the Madge Networks service on the web, use either a web browser or FTP software.

### Using a web browser

To access the full home page service, enter the URL:

<http://www.madge.com>

### Using FTP software

If you do not have a web browser, you can still download new or updated software by using FTP software.

If you use FTP software:

- 1 Connect to <ftp.madge.com>
- 2 The system prompts you for your login name.  
Type **ANONYMOUS**
- 3 The system prompts you for a password.  
Type your full email address.
- 4 Once this is complete, you can issue file transfer commands.

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## Telephone, fax, and email

Region	Support service	Support number
Europe, Middle East, Africa	Telephone	+44 1753 661952
	Fax	+44 1753 661027
	Email	eurtech@madge.com
Americas	Telephone	+1 800 876 2343
	Fax	+1 408 955 0970
	Email	us-suprt@madge.com
Asia, Australia, New Zealand	Telephone	+61 2 993 61 711/712
	Fax	+61 2 993 61 799
	Email	asiatech@madge.com
Japan	Telephone	+81 45 825 8192
	Fax	+81 45 825 8072

## Toll-free regional support numbers

Country	Number
Americas	800 876 2343
Australia	800 653 816
Austria	0660 8366
Belgium	0800 10485
Canada	800 876 2343
China	0800 610 0112
Denmark	800 17649
Finland	0800 118 074
France	0800 90 82 50
Germany	00 800 8688 2800
Hong Kong (toll free to Australia)	800 933 127
Indonesia	00 180 361403
Israel	177 440 2530
Italy	800 1678 72092
Japan	00 3161 6481
Latin/South America	1 408 955 0970

Country	Number
Malaysia	1 800 80 1716
Netherlands	0800 022 7120
New Zealand	0800 445398
Norway	800 11759
Philippines	1 800 1611 0108
Portugal	0505 44 4602
Singapore	800 6161 459
South Africa	0800 991013
South Korea	00 798 611 4025
Spain	900 974412
Sweden	020 793127
Switzerland ( <i>French</i> )	0800 55 6432
Switzerland ( <i>German</i> )	0800 55 1057
Taiwan	00 8061 1250
Thailand	001 800 611 4022
United Kingdom	0345 125539*

\* Indicates local telephone numbers where the calls are charged at the normal rate

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# Glossary

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## **All Routes Broadcast (ARB) or All Routes Explorer (ARE)**

A communication that is addressed to all of the LANs on an internetwork or to all the segments of a virtual LAN.

The Smart Ringswitch buffers each frame into memory, then copies it to each token-ring switch port. Each token-ring switch port updates the Routing Information Field (RIF) of the frame in memory with the bridge number and ring number, to reflect that the frame has been copied to the attached ring.

## **backbone network**

A network that connects several different networks together, often using a high-speed networking technology such as Fiber Distributed Data Interface (FDDI) or Asynchronous Transfer Mode (ATM).

## **beaconing**

A warning signal that a token-ring station sends to all the other stations on the ring when it detects a hard error on the ring.

## **boot code**

The firmware for booting and initialization that resides in the system Read-Only Memory (ROM). When you want to upgrade the firmware, instead of replacing the system ROM, you can download new software using TrueView Ringswitch Manager.

---

**bridge**

A device that connects one LAN to another at the datalink layer of the OSI model. The two main types of bridges are source routing bridges and transparent bridges. The traditional method for connecting multiple token-ring networks is by using a source routing bridge.

**bridge number**

A single hexadecimal number in the range 0 to F, that is combined with the ring numbers of the two token-ring networks that are connected by a bridge to uniquely identify the bridge.

**bridge priority**

A five-digit decimal number that determines which one of two or more parallel bridges connecting the same two token rings is able to forward single-route broadcast and transparent-bridged frames at any one time. Inserting a lower number increases the priority of the device and the probability that it will be selected as the root bridge.

The bridge root priority applies when the spanning tree mode is set to Auto or the Ringswitch is in Transparent bridging, Source-Route bridging, or Source-Route Transparent Plus bridging mode.

**broadcast filtering**

The method by which the Smart Ringswitch restricts broadcast frames to a group of rings defined by the user.

**broadcast frames**

Frames that are addressed to multiple devices on an internetwork. The Smart Ringswitch can forward broadcast frames efficiently by transmitting frames simultaneously on multiple token-ring switch ports.

---

**buffering**

The method by which the Smart Ringswitch stores incoming data in memory before transmitting it on the output port.

**CAU RI/RO mode**

In CAU RI/RO interface mode, a fiber token-ring port behaves like the Ring-In or Ring-Out port on a Controlled Access Unit (CAU). For example, it enables you to connect to the Ring-In or Ring-Out port of a Madge Smart CAU that has a Fiber Trunk Link (FTL) Module installed, or an IBM 8230 Token-Ring CAU that has an Optical Fiber RI/RO Module installed.

**Controlled Access Unit (CAU)**

An intelligent wiring concentrator, such as the Madge Smart CAU or the IBM 8230 Token Ring Network Controlled Access Unit. You connect the CAU to lobe attachment modules (LAMs) to attach Token Ring stations.

**collapsed backbone**

A single device that can replace a backbone network, such as the Smart Ringswitch, or a multiport bridge. A collapsed backbone device supports the direct attachment of network segments, which typically provides better performance than connecting segments to a backbone ring using bridges.

**concentrator mode**

The mode in which a port behaves like a lobe attachment module (LAM) port and detects the phantom drive signal that is generated when the connected device inserts.

---

**cut-through**

The technique by which the Smart Ringswitch starts to forward a frame on the output port before the entire frame is received into memory.

Cut-through switching incurs considerably less inter-station latency than the store-and-forward technique associated with bridges and routers.

**Cyclic Redundancy Check (CRC)**

A check to ensure that the data in a frame is not corrupted. Bridges and routers perform a CRC on incoming data, and typically discard corrupted frames.

**Emulated LAN (ELAN)**

An Emulated LAN (ELAN) is a collection of services which enables legacy LAN applications to use an ATM transport medium transparently, allowing existing Ethernet and Token Ring LANs to communicate with ATM end-stations.

**FTL module**

The Fiber Trunk Link (FTL) module is an optional unit that extends the functionality of the Madge Smart CAU Plus or Madge Smart RAM STP. The FTL module has two female ST optical connectors for connection to the main and backup signal cables.

The FTL module enables you to connect the Ring-In or Ring-Out port of a Madge Smart CAU Plus to a fiber token-ring port on the Smart Ringswitch.

**Fault Finding**

The process by which a port detects and isolates a node causing continuous beaconing or if the node is in the claim-token process continuously. Only applicable when a GroupSwitch is in 5 port hub mode.

---

**Fault disabled**

The state in which a port isolates nodes.

**forward delay**

A Spanning Tree parameter that determines the frequency with which a port changes its forwarding status when moving towards the forwarding state. The value determines how long each port remains in the Listening and Learning states, which precede the Forwarding state.

**hello time**

Determines the frequency with which a bridge sends Configuration bridge PDUs when it is the root of the spanning tree, or trying to become the root, measured in hundredths of a second.

**hop count**

The total number of bridge hops an All Routes Explorer (ARE) frame can make. If a frame that has exceeded its hop count is passed to the Smart Ringswitch, the frame is not forwarded.

**hop count exceeded discards**

If the Ringswitch receives an All Routes Explorer (ARE) frame which has already gone across a number of bridges, and the hop count on the receiving port is equal to or less than the number of bridges, the Ringswitch increments the hop count exceeded counter for that port.

**impermeable virtual source-routing LAN**

An explicit list of the rings that belong to the virtual LAN.

Define impermeable virtual LANs when one or more Ringswitch devices connect a number of token-rings to form a large source-routed LAN.

**internetwork**

Two or more LANs connected by one or more switches, routers, or bridges.

---

**IP address**

A 32-bit integer address that is used in communications with a device on an IP network.

**IPX network number**

An eight-digit hexadecimal number in the range 00000001 to FFFFFFFF, that uniquely identifies a segment on an IPX network. IPX routers and servers connected to the same segment must use the same IPX network number to identify the segment.

**latency**

The time taken by a bridge, router, or switch to transmit a frame onto its output port after the frame has been received into the input buffer.

**LAN Emulation Client (LEC)**

The LAN Emulation Client (LEC) is a process that resides in an end station or in a bridge which provides an entry point to the emulated LAN (ELAN). The LEC in the Smart Ringswitch resides in the ATM Module, and provides most of the work of the LAN emulation.

**LAN Emulation Configuration Server (LECS)**

The LAN Emulation Configuration Server (LECS) decides which LAN Emulation Server (LES) to direct a LEC to on the basis of the information that the LEC gives it. Before a LEC can join an emulated LAN (ELAN), it must get the ATM address of the LES from the LECS.

**Leg port**

A virtual connection into the Smart Ringswitch TLS Module. The Smart Ringswitch TLS Module supports up to 16 such connections.

---

**Lobe Attachment Module (LAM)**

An expansion module that allows you to attach Token Ring stations, such as the Madge Smart LAM STP or the IBM 8230 Token Ring Network Lobe Attachment Module. A LAM is attached to a controlled access unit (CAU).

**Management Information Base (MIB)**

The database of management information that resides in a device that is managed via SNMP.

**max age**

Determines the maximum age of Spanning Tree information that a bridge learns from the network on any port before it is discarded, measured in hundredths of a second.

**Multistation Access Unit (MAU)**

A hub, also known as a passive hub or a wiring concentrator, that is used to attach nodes to a Token Ring network.

**microcode**

See boot code; run-time microcode.

**multiport bridge**

A bridge that has more than two ports.

**Network Service Access Point (NSAP)**

Is a 20 byte address made up of the address of the ATM device (19 bytes) plus a selector (1 byte). The ATM device address consists of the prefix and the ESI. The selector is used to identify an individual application on an end-station.

---

**node mode**

The mode in which a port behaves like an adapter and generates a phantom drive signal to insert into the device that is connected.

**path cost**

A 16-bit integer that determines the relative length of a path between two rings. The port path cost can be used to select the shortest and most efficient path.

The port path cost applies when the port spanning tree mode is set to Auto, or the Ringswitch is in Transparent, Source-Route Transparent, or Source-Route Transparent Plus forwarding mode.

**permeable virtual LAN**

Permeable source-routing virtual LANs are a user defined list of rings that do not restrict the forwarding of broadcast traffic to an explicit list of the rings.

Define permeable virtual LANs when Ringswitch devices are installed in a large source-routed network, to define logical workgroups without explicitly specifying the rings that belong to each virtual LAN.

**phantom drive**

The signal that an adapter card sends to a concentrator to activate the port into which it is attempting to insert. When the token-ring switch ports of the Smart Ringswitch are configured as node ports, they send a phantom drive to insert into the connected device. When they are configured as concentrator ports, they receive phantom drive from the connected device. Phantom drives are only applicable to copper-based half-duplex token-ring.

**ring number**

A three-digit hexadecimal number in the range 001 to FFF, that identifies the token-ring to which the port is attached.

---

**router**

A device that connects two or more LANs at the network layer of the OSI model.

Like bridges, routers operate in store-and-forward mode, buffering each packet into memory before determining the destination of the frame. A router also amends the header on each frame once it buffered the frame into memory, to reflect the routing decision that was made.

**Routing Information Field (RIF)**

The field in the header of an incoming source-routed frame that the Smart Ringswitch uses to determine the correct output port.

**run-time microcode**

The software that the Ringswitch needs to enable it to perform switching functions. You can download upgrade software to the Ringswitch using TrueView Ringswitch Manager.

**segment mismatch discards**

If the Ringswitch receives an All Routes Broadcast (ARE) or Spanning Tree Explorer (STE) frame where the last ring number in the Routing Information Field (RIF) does not match the configured ring number, it increments the segment mismatch discards counter for the receiving port.

Segment mismatch discards indicate that there is a bridge, switch or server on the same ring segment, with a different configured ring number.

**SDH**

Synchronous Digital Hierarchy. A physical framing mode used by the ATM card.

---

**Single-Route Broadcast (SRB) or Spanning Tree Explorer (STE)**

A communication addressed to all of the LANs on an internetwork or to all the segments of a virtual LAN.

The Smart Ringswitch buffers each frame into memory, then copies it to the token-ring switch port subject to defined virtual LANs. The token-ring switch port updates the frame in memory with its ring number, to reflect that the frame has been copied to the attached ring.

**SNMP**

Simple Network Management Protocol. A protocol designed to enable network management programs to communicate with MIBs on networked devices.

**SONET**

Synchronous Optical Network. A physical framing mode used by the ATM module, during which cells and frames are transmitted continuously. SONET is the ATM Forum prescribed interface to the telephone network.

**Source Routing**

Source Routing is a method for token-ring bridging that involves the endstations for path control. Source-routing bridges are traditionally used to connect token-ring LANs. Source-routing bridges do not make use of lookup tables, but use a non-address-based system of establishing a route between participating nodes.

---

**Source-Route Transparent (SRT) bridging**

Source-Route Transparent (SRT) is a technique that enables Source Routing and Transparent bridging to co-exist in the same network. Frames that contain routing information are forwarded using the source-route bridging technique, and frames that do not contain routing information are forwarded using the Transparent bridging technique.

**Source-Route Transparent Plus (SRT+) bridging**

Source-Route Transparent Plus bridging is a bridging technique, developed by Madge Networks, that combines the benefits of source-route bridging and Transparent bridging while allowing the same ring number to be used on multiple ports.

**Spanning Tree Protocol (STP)**

The Smart Ringswitch can use either the IBM or IEEE 802.1D spanning tree protocol to determine the best path for frames when there are multiple path routes in a network. The Ringswitch uses a common spanning tree process to determine paths between rings for both source-route bridging and Transparent bridging. This means that where multiple paths exist between rings, one of the paths will be selected and it will be used for both source-route Spanning Tree Explorer (STE) frames and transparent-bridged frames.

**subnet mask**

A 32-bit integer address that defines how an IP address is divided into sub-network address and local host address portions.

**switching**

Like bridging, switching provides a connection between LAN segments. However, a cut-through switch forwards packets on direct connections between the input and output ports, without buffering them into memory.

---

**Telnet**

The IP terminal-emulation protocol that you can use to connect a terminal to the Smart Ringswitch, to perform simple management tasks. You cannot use the Telnet interface to set up virtual LANs.

**Transparent Bridging**

Transparent bridging operates at the datalink layer and filters or passes traffic based on the destination address of the frame. A transparent bridge makes decisions concerned with passing frames through the network, whereas a source-routing bridge forwards frames according to routing information in the frame. Transparent bridges are sometimes referred to as promiscuous bridges, because they read every frame to determine whether the frame should be forwarded to the remote network.

**virtual LAN**

The Smart Ringswitch supports source routing and transparent virtual LANs, which are configured independently.

A source-routing virtual LAN consists of two or more Token Ring segments that are joined by devices, where stations can only make connections to other stations or servers that are part of the same virtual LAN. Therefore, broadcast traffic originating on any ring is only received by stations on rings that belong to the same virtual LAN.

A transparent virtual LAN consists of one or more token-ring ports on a single Ringswitch, where ports can only forward frames to other ports that are part of the same virtual LAN. The result is that traffic originating on any port is only received by ports that belong to the same virtual LAN.

Transparent virtual LANs do not affect addresses in the transparent bridge static address table, which always override defined virtual LANs when forwarding to allowed ports.

**virtual port**

See leg port.

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**UNI**

User-Network Interface. An ATM signalling protocol for establishing connections between end-stations across an ATM network. The ATM Module supports UNI versions 3.0 and 3.1.

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